

SL.NO:1359

SUBJECT CODE:17MESE17

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - MODERN MANUFACTURING METHODS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 State piezoelectric effect.
- 2 State the working principle of the Electrical Discharge machining process.
- 3 List out the applications of EDM process.
- 4 State the working principle of EBM.
- 5 List the unconventional machining process which uses mechanical energy.
- 6 Summarize the Conventional Machining Processes.
- 7 Show the unique benefits offered by WJM process.
- 8 Predict the principle behind the abrasive jet machining.
- 9 Predict the limitations of EBM.
- 10 Illustrate the characteristics of Laser beam.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain with neat diagram the working principle of piezoelectric transducer.
OR
b. Explain with neat diagram the working principle of PAM.
- 12 a. Briefly explain the unconventional machining processes and list out the Limitations and Advantages.
OR
b. Compare between the conventional and unconventional machining processes.
- 13 a. Demonstrate the construction and working principle of USM.
OR
b. Demonstrate elaborately about process parameters in USM.

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14 a. Demonstrate the process parameters affecting the MRR in AJM.

OR

b. Demonstrate the working principle of Wire cut EDM with neat diagram.

15 a. Illustrate in detail about tool material and tool wear in EDM.

OR

b. Predict the features of the wire cut EDM.

16 a. Explain with neat diagram the working principle of ECH.

OR

b. Illustrate with neat diagram the working principle of ECG.

17 a. Predict the advantages, disadvantages and applications of ECH.

OR

b. Examine the similarities and differences of ECM, ECG and ECH.

18 a. Predict the advantages, disadvantages and applications of PAM.

OR

b. Determine the principle of LASER beam production.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the reasons for the development of unconventional machining process. Discuss about the criteria recommended in the selection of these processes.

OR

b. Determine the effect of operating parameters on material removal rate. List out the applications of USM.

20 a. Demonstrate the principle of electrochemical grinding with a suitable sketch. State the process capabilities and applications.

OR

b. Determine about the process parameters of PAM and its influence in machining quality.

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SL.NO:1357

SUBJECT CODE:17MESE32

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - COMPOSITE MATERIALS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Name few Fibers used in FRP
- 2 Define Whisker.
- 3 Define closed mold process of composites.
- 4 List the effects of environmental properties on FRP.
- 5 Name few Failure theories.
- 6 State what will happen when a Composite is stressed.
- 7 List the Stresses within a Cross-ply Laminate
- 8 Define Hasselman-Johnson model.
- 9 Describe wet winding.
- 10 Identify how to define composite material properties in FEA.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Compare the longitudinal and transverse unidirectional composites.
OR
b. Determine the Micro-mechanics of behavior of Lamina.
- 12 a. Explain the any two methods of producing the MMC.
OR
b. Explain the processing and production techniques of CMC.
- 13 a. Describe re-reinforcement. Explain the characteristics of the materials used for reinforcement.
OR
b. Explain with a neat sketch the working principle of Spray up technique.
- 14 a. Explain with a neat sketch the working principle of autoclave technique of manufacturing in composites.
OR
b. Explain with a neat sketch the working principle of pultrusion method.

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15 a. Explain two Selection of fiber-matrix.

OR

b. Explain the effects of thermal properties on FRP.

16 a. Explain the effects of environmental properties on FRP.

OR

b. Explain the asymmetric structure on FRP.

17 a. Explain the fracture of composites.

OR

b. Explain the Shear lag model used in composite materials.

18 a. Explain the model for Models for E_2 .

OR

b. Explain Failure under Multi axial Stress States (Plane Stress) - Tsai-Hill.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Determination of Longitudinal Modulus unidirectional composites.

OR

b. Explain the working principle and advantages of dry winding.

20 a. Explain the working principle and advantages of wet winding.

OR

b. Explain and derive the Eshelby's models used in composite materials.

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SUBJECT CODE:17MECC17

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
AUTOMOTIVE ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 State the function of a bumper.
- 2 Identify the function of valve guides.
- 3 Name the function of fuel supply system.
- 4 Name the sensors used in ECU.
- 5 State the function of a free wheel unit.
- 6 List the function of a rear axle.
- 7 List the requirements of a automobile brakes.
- 8 Mention the major constituents of natural gas and LPG.
- 9 Name the two types of LPG used for automotive engine fuel.
- 10 Classify the various steering gear bores commonly used.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Discuss in detail the functions of a chassis frame and the loads to which a chassis frame is subjected.

OR

b. Illustrate with necessary sketches explain a rear Engine rear Wheel Drive system. Also tell about the advantages and disadvantages.
- 12 a. Explain a Four Wheel Drive Vehicle with a neat sketch of its layout.

OR

b. Illustrate with the help of a neat sketch explain any gasoline injection system.
- 13 a. Explain Electronic Control of Diesel Injection with a neat diagram.

OR

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b. Draw circuits of electronic ignition system and name its components.

14 a. Explain the functions of solenoid coil in electronic injection system in detail.

OR

b. Explain with necessary sketches the construction and operation of constant mesh gear box.

15 a. Discuss about the construction and working of an Overdrive arrangement.

OR

b. Sketch the general arrangement of a live axle and label the various loads that it has to withstand. Explain them.

16 a. What is the necessity of the suspension system and explain about the suspension systems.

OR

b. Describe the concepts of Oversteer, Understeer, Cornering power and Slip Angle.

17 a. With the help of a neat and labeled sketches, describe a type of mechanical brake used in automotive practice.

OR

b. Discuss in detail the performance and emission characteristics of CNG as engine fuel.

18 a. What are properties of hydrogen gas? Discuss the potential of using hydrogen as a fuel for automobiles.

OR

b. Describe the construction and operating principle of a turbocharger with neat sketch.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the construction and working principle of two stroke Internal Combustion Engine with neat sketch.

OR

b. Explain rotary Diesel Injection with a neat sketch.

20 a. Explain with a neat sketch the operation of differential unit.

OR

b. Explain the working construction of air brake system with neat diagram.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./B.TECH DEGREE EXAMINATIONS- FEB -2022
COMMON TO CIVIL ,CSE,ECE,EEE, BME & MECH
BASICS OF CIVIL AND MECHANICAL ENGINEERING
(Candidates admitted under 2017 Regulations-SCBCS)

Time : 1 1/2 Hours

Maximum Marks:50 Marks

CIVIL ENGINEERING

Answer **ALL** questions

Part-A (5 x 2 =10 Marks)

- 1 What do you mean by plane surveying?
- 2 What are the instruments used in chain surveying?
- 3 What is meant by frog in the bricks?
- 4 List out the Methods of curing.
- 5 What are the classification surveying based on instruments?

Answer **ALL** questions

Part-B (2 x12 =24 Marks)

- 6 a. How survey has been classified? Explain each survey briefly.
OR
b. Explain the characteristics of good Building stone.
- 7 a. Compare stone masonry and brick masonry.
OR
b. Explain the types of cement concrete.

Answer **ALL** questions

PART-C (1 x 16 = 16)

- 8 a. Briefly explain the types of Floors.
OR
b. Explain the types of Bridges.

MECHANICAL ENGINEERING

(Candidates admitted under 2017 Regulations-SCBCS)

Time : 1 1/2 Hours

Maximum Marks:50 Marks

Answer **ALL** questions**Part-A (5 x 2 =10 Marks)**

- 1 Define casting and foundry.
- 2 Name the three characteristics of foundry sand.
- 3 Name the sources of energy for a welding.
- 4 List out the different types of arc welding.
- 5 What is the standard specification of an electrode?

Answer **ALL** questions**Part-B (2 x12 =24 Marks)**

- 6 a. Explain submerged arc welding in detail.
OR
b. Compare Petrol Engine and diesel engine.
- 7 a. Describe the construction and operation of a Simple Carburetor.
OR
b. Compare two stroke and four stroke engines.

Answer **ALL** questions**PART-C (1 x 16 = 16)**

- 8 a. With the help of neat sketch explain in details and the construction and working of different engine components.
OR
b. Construct with a neat diagram and briefly explain the fuel supply system in a diesel engine.

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VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
COMPUTER INTEGRATED MANUFACTURING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List the role of computers in Manufacturing.
- 2 List the benefits of concurrent engineering.
- 3 List the types of parametric modeling.
- 4 List any four post processor statements in APT.
- 5 Indicate when the GT is applied in manufacturing industry.
- 6 Write down the three categories of parts classification systems.
- 7 Define in-line layout in FMS.
- 8 Name the types of voice recognition system.
- 9 Describe shortly about DNC.
- 10 Classify the GT manufacturing cells.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain topological consistency with examples. Discuss the rules to be followed to get Geometrical valid solid models.

OR

 - b. Develop a program for taper turning using Box Turning cycle.
- 12 a. With the help of flow diagram, explain the Pahl and Beitz model.

OR

 - b. Explain the general guidelines to be followed in DFM.
- 13 a. Compare the conventional product cycle with computer aided product cycle.

OR

 - b. Explain the various stages in Ohsguga model.

(p.t.o)

14 a. Classify the graphics standards. Name some important standards used in plotting and CAD data exchange.

OR

b. With suitable examples, explain how solid models are generated using Boolean operation.

15 a. Explain the various features of solid modeling packages.

OR

b. Explain the methods used for position and velocity feedback in CNC machines.

16 a. Discuss in detail about tooling for CNC machines.

OR

b. Explain the MICLASS system of parts classification and coding.

17 a. Explain about part manufacturing attribute in Group Technology.

OR

b. Describe shop floor control. List the functions of SFC.

18 a. Explain the FMS components in detail.

OR

b. Explain in detail about automatic identification methods.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain in detail about Generative type CAPP for a process.

OR

b. With neat sketch, explain in detail about the wire frame modeling.

20 a. With the help of block diagram, explain the closed loop control system in CNC machines.

OR

b. Explain the various techniques used in factory data collection system.

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SL.NO:1338

SUBJECT CODE:17MECC14

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
HEAT AND MASS TRANSFER

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define overall heat transfer co-efficient.
- 2 State the applications of fins.
- 3 Define unsteady state conduction.
- 4 Write down the expression for Characteristic length of Slab.
- 5 Name the advantages and limitations of dimensional analysis.
- 6 Define Grashoff number (Gr).
- 7 Define emissive power.
- 8 Describe about parallel flow heat exchanger.
- 9 Define convective mass transfer.
- 10 Define steady state diffusion.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. A hollow cylinder 5cm inner radius and 10cm outer radius has an inner surface temperature of 200°C and outer surface temperature of 100°C. If the thermal conductivity is 70W/m K, find heat transfer per unit length

OR

- b. A hot steam pipe having an inside surface temperature of 250 °C has an inside diameter of 80 mm and a wall thickness of 5.5mm. It is covered with a 90 mm layer of insulation having thermal conductivity of 0.5 W/m K followed by a 40 mm layer of insulation having thermal conductivity of 0.25 W/m K. The outside surface temperature of insulation is 20 °C. Calculate heat loss per meter length. Assume thermal conductivity of the pipe as 47 W/m K.
- 12 a. A hollow sphere 1.2 m inner diameter and 1.7m outer diameter is having a thermal conductivity of 1W/m K. The inner surface temperature is 70 K and outer surface temperature 300 K. Determine heat transfer rate and Temperature at a radius of 650mm.

(P.T.O)

OR

- b. An aluminum cube 6cm on a side is originally at a temperature of 500 °C. It is suddenly immersed in a liquid at 10 °C for which h is 120 W/m²K. Determine the time required for the cube to reach a temperature of 250 °C. For aluminum $\rho = 2700 \text{ kg/m}^3$, $C_p = 900 \text{ J/kg K}$, $k = 204 \text{ W/m K}$.
- 13 a. A large concrete high way initially at a temperature of 70 °C and stream water is directed on the high way so that the surface temperature is suddenly lowered to 40°C. Determine the time required to reach 55°C at a depth of 4cm from the surface.

OR

- b. A copper rod of outer diameter 20 mm initially at a temperature of 380 °C is suddenly immersed in water at 100 °C. Determine the time required for the rod to reach 210 °C. Take convective heat transfer co-efficient is 95 W/m²K.
- 14 a. An aluminum slab of 5 cm thick initially at a temperature of 400 °C. It is suddenly immersed in a water at 90 °C. Calculate the mid plane temperature after 1 minutes and also calculate the temperature inside the plate at a distance of 10 mm from the mid plane. Take $h = 1800 \text{ W/m}^2 \text{ K}$.

OR

- b. Atmospheric air at 300K with a velocity of 2.5m/s flows over a flat plate of length $L=2\text{m}$, width $W=1\text{m}$ maintained at uniform temperature of 400K. Calculate the local heat transfer co-efficient at 1m length and average heat transfer coefficient from $L=0$ to $L=2\text{m}$. Also find the heat transfer.
- 15 a. Air at pressure of 8kN/m² and a temperature of 250°C flows over flat plate 0.3m wide and 1m long at a velocity of 8 m/s. If the plate is to be maintained at a temperature of 78°C, Determine the rate of heat to be removed continuously from the plate.

OR

- b. Air at 30°C, 0.2 m/s flows across a 120 W electric bulb at 130°C. Find heat transfer and power lost due to convection if bulb diameter is 70mm.
- 16 a. A furnace wall emits radiation at 2000K. Treating it as black body radiation, calculate (i) monochromatic radiant flux density at 1 $\mu \text{ m}$ wavelength. (ii) Wavelength at which emission is maximum and the corresponding emissive power. (iii) Total emissive power.

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OR

- b. 800 W/m^2 of radiant energy is incident upon a surface, out of which 300 W/m^2 is absorbed, 100 W/m^2 is reflected and the remainder is transmitted through the surface. Calculate the following (i) Absorptivity (ii) Reflectivity (iii) Transmissivity.

- 17 a. In a counter flow double pipe heat exchanger, oil is cooled from 85°C to 55°C by water entering at 25°C . The mass flow rate of oil is $9,800 \text{ kg/hr}$ and specific heat of oil is 2000 J/kg K . The mass flow rate of water is $8,000 \text{ kg/hr}$ and specific heat of water is 4180 J/kg K . Determine the heat exchanger area and heat transfer rate for overall heat transfer co-efficient of $280 \text{ W/m}^2\text{K}$.

OR

- b. Gaseous hydrogen is stored in a rectangular container. The walls of the container are of steel having 25 mm thickness. At the inner surface of the container, the molar concentration of hydrogen in the steel is 1.2 kg mole/m^3 while at the outer surface of the container the molar concentration is zero. Calculate the molar diffusion flux for hydrogen through the steel. Take diffusion coefficient for hydrogen in steel is $0.24 \times 10^{-12} \text{ m}^2/\text{s}$.
- 18 a. An open pan 210 mm in diameter & 75 mm deep contains water at 25°C & it is exposed to dry atmospheric air. Calculate the diffusion co-efficient of water in air. Take the rate of diffusion of water vapour is $8.52 \times 10^{-4} \text{ kg/h}$.

OR

- b. Air at 30°C and atmospheric pressure flows in a 12 mm diameter tube of 1 metre length with a velocity of 2.5 m/s . The inside surface of the tube contains a deposit of naphthalene. Determine the average mass transfer co-efficient. Take diffusion co-efficient, $D_{ab} = 0.62 \times 10^{-5} \text{ m}^2/\text{s}$.

Answer ALL questions**PART-C (2 x 15 = 30)**

- 19 a. Derive the general heat conduction equation in Cartesian co-ordinates.

OR

- b. A long steel cylinder 12 cm diameter and initially at 20°C is placed into furnace at 820°C with $h = 140 \text{ W/m}^2 \text{ K}$. Calculate the time required for the axis temperature to reach 800°C . Also calculate the corresponding temperature at a radius of 5.4 cm at that time. Physical properties of steel are $k = 21 \text{ W/m K}$, $\alpha = 6.11 \times 10^{-6} \text{ m}^2/\text{s}$.

(P.T.O)

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- 20 a. When 0.6 kg of water per minute is passed through a tube of 2 cm diameter, it is found to be heated from 20 °C to 60 °C. The heating is achieved by condensing steam on the surface of the tube and subsequently the surface temperature of the tube is maintained at 90 °C. Determine the length of the tube required for fully developed flow.

OR

b.

CO₂ and air experience equimolar counter diffusion in a circular tube whose length & diameter are 1 m & 50 mm respectively. The system is at a total pressure of 1 atm & a temperature of 25°C. The ends of the tube are connected to large chambers in which the species concentration are maintained at fixed values. Partial pressure of CO₂ at one end is 190 mm of Hg while at the other end is 95 mm Hg. Estimate the mass transfer rate of CO₂ & air through the tube.

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SL.NO:1331

SUBJECT CODE:17MECC05

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

MECHANICAL BEHAVIOUR OF MATERIALS AND METALLURGY

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Discuss about solid solution hardening.
- 2 Tell the required properties of a tool steel.
- 3 List the advantages of the equilibrium diagrams.
- 4 Define hardenability.
- 5 Define Fretting corrosion.
- 6 Describe about precipitation hardening.
- 7 Discuss how to prevent the creep fractures.
- 8 Discuss about season cracking of brass.
- 9 Discuss a note on Dezincification.
- 10 Discuss about sintering.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Illustrate with a neat sketch of (i) Flame hardening (ii) induction hardening

OR

- b. List the methods of corrosion protection and explain why each method is effective.

- 12 a. Illustrate with neat diagram and explain how to conduct fatigue test for the engineering materials.

OR

- b. Describe with neat sketch of TTT diagram and mark the phases.

- 13 a. Illustrate with suitable treatment of age hardening process.

OR

- b. Predict and explain in detail about the factors influencing corrosion.

- 14 a. Illustrate with neat sketch about the filament winding with its application.

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OR

b. Describe the process of powder metallurgy method that used to produce automobile parts.

15 a. Discuss the composition, properties and applications of aluminium based alloys.

OR

b. Explain the applications of Composite materials in various fields.

16 a. Explain the mechanisms of plastic deformation.

OR

b. Describe the mechanisms of plastic deformation of metals by slip and twinning.

17 a. Describe in detail the following (i) Full annealing (ii) stress relief annealing

OR

b. Describe strain hardening mechanism used to strengthen the steel.

18 a. Explain in detail about the mechanism of corrosion.

OR

b. Briefly explain about the term (i) Blending (ii) Compaction (iii) Sintering.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Discuss why powder metallurgy manufacturing method is very important for manufacturing components in industries and compare with casting process.

OR

b. Determine in detail the corrosive protection method of Chemical Vapour Deposition (CVD).

20 a. List the purpose of heat treatment and briefly explain assess various stages of heat treatment process.

OR

b. Discuss about dezincification. Explain its cause and remedial measures.

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SL.NO:1326

SUBJECT CODE:17MECC11

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

GAS DYNAMICS AND JET PROPULSION

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Write down the Stagnation enthalpy in terms static enthalpy and velocity of flow.
- 2 Give the relation between M^* and M .
- 3 What is choked flow through nozzle?
- 4 Draw the variation of Mach number along the length of convergent and divergent duct when it acts a venture meter.
- 5 What is Rayleigh line and Fanno line?
- 6 Write the expression for T_0/T_0^* ?
- 7 What is the Normal shock and Oblique shock?
- 8 Define specific Impulse.
- 9 Define the term: JATO and RATO.
- 10 Mention any two differences between compressible fluid and incompressible fluid.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Air flows in a duct with velocity of 210m/s. The temperature of air measured at a point along the duct is 30°C and the air pressure is 5 bar. Determine (i) Stagnation Pressure (ii) Mach number at that point.

OR
- b. A plane travels with a velocity of 1,600km/h at an altitude where the pressure and temperature are 40kPa and -35°C. Find mach angle and Mach number.
- 12 a. The area of cross section at the entry of a diffuser is 0.24 m². Mach no. is 1.5 and temperature of air 340 K. If the exit mach no. is 0.78, determine the velocity and temperature of air and the area of cross section at exit for isentropic flow.

(P.T.O)

OR

- b. The Mach number and pressure at the entry of a subsonic diffuser are 0.9 and 4.165 bar. Determine the area ratio required and the pressure rise of 17, the mach number at the exit of diffuser is 0.2. Assume isentropic diffusion of air.
- 13 a. The conditions of a gas in a combustion chamber at entry are $M_1 = 0.28$, $T_{01} = 380$ k, $P_{01} = 4.9$ bar. The heat supplied in the combustion chamber is 620 kJ / kg. Determine Mach number, pressure and temperature of the gas at exit and also determine the stagnation pressure loss during heating. Take $\gamma = 1.4$, $C_p = 1.22$ kJ/kgK

OR

- b. A circular duct passes 8.25 Kg/s of air at an exit Mach number of 0.5. the entry pressure and temperature is 3.5 bar and 38°C respectively and coefficient of friction is 0.005. If the Mach number at entry is 0.15, determine a) Diameter of the duct, b) Length of the duct, c) Pressure and Temperature at the exit, d) Stagnation pressure loss
- 14 a. The Mach number of exit combustion chamber is 0.9 and ratio of stagnation temperature at exit and entry is 3.74. If the pressure, temperature of gas at exit are 2.5 bar and 1000°C. Determine a) Mach no at entry, b) Pressure and Temperature at entry, c) Heat supplied per kg and maximum heat that can be supplied.

OR

- b. A Convergent –Divergent Nozzle is designed to expand air from a reservoir in which the pressure is 800Kpa and Temperature is 40 °C, to give a mach number at exit of 2.5. The throat area is 25cm². Find (i) Mass flow rate (ii) Exit area (iii) When a normal shock appears at a section where the area is 40cm². Determine Pressure and temperature at exit.
- 15 a. A Turbojet aircraft flies at 870 Km/hr at an altitude of 10000m. Diameter of the air inlet section=0.74m, velocity of the gases at exit of the jet pipe =505m/s, Pressure at the exit of the jet pipe=0.28 bar and the Air-fuel ratio=40. Calculate the following. (a) Air flow rate through the engine, (b) Thrust, (c) Specific thrust, (d) Specific impulse, (e) Thrust power.

OR

- b. Air is flowing into an insulated duct with a velocity of 150m/s. The temperature and pressure at the inlet are 280°C and 28 bar respectively. Find the temperature at a section in the duct, where the pressure is 15.7 bar. If the duct diameter is 15 cm and the friction factor is 0.005. Find the distance between two sections.
- 16 a. Explain the various regions of flow with neat sketch.

OR

b. Derive the expression for mass flow rate in terms of Mach number.

17 a. Derive the relation for Sonic speed ratio.

OR

b. Explain the principle and operation of Pulsejet engine and write merits and demerits with suitable diagram.

18 a. Compare solid and liquid propelled rocket systems. Also explain how a solid propellant engine works.

OR

b. Derive the expression for Acoustic velocity in terms of temp of fluid.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. A CD Nozzle has an area ratio of 2 (Exit area to Throat). The air enters a nozzle at 7 bar and 100°C (stagnation conditions). The throat area is 6.5cm². Determine Mass flow rate, Exit temp, Exit Pr, Exit Mach no and Exit velocity for the following conditions.

- a) Sonic velocity at throat (consider a nozzle passage of Diverging section)
- b) Sonic velocity at throat (consider a Diffuser passage of Diverging section)

OR

b. An aircraft flies at 800 km/hr at an altitude of 11000 m (T = 216.65 K, P = 0.226 bar). The air is reversibly compressed in an inlet diffuser. If the mach number at the exit of the diffuser is 0.35. Determine (a) entry of the Mach number (b) velocity, pressure and temperature of air at the diffuser exit.

20 a. Air flows adiabatically in a pipe. A normal shock wave is formed. The Pressure and Temperature of air before the shock are 150kN/m² and 25 °C respectively. The Pressure just after the normal shock is 350kN/m². Calculate (i) Mach number before the shock (ii) Mach number, static temperature, velocity of air after the shock wave (iii) Increase in density of air (iv) Loss of Stagnation Pressure of air (v) Change in Entropy.

OR

b. Derive the Equation for Rankine –Hugoniot equation

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SUBJECT CODE:17MECC03

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ENGINEERING MECHANICS

(Candidates admitted under 2017 Regulations-SCBCS)

Time : Three Hours

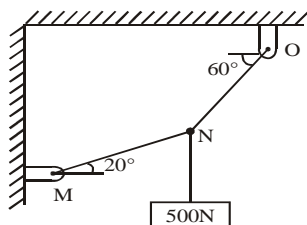
Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define Engineering mechanics.
- 2 Explain the equivalent forces
- 3 List the conditions where the roller supports are used.
- 4 Discuss the equilibrium of a rigid body in space.
- 5 Define centre of gravity
- 6 Explain perpendicular axis theorem.
- 7 Define friction.
- 8 Explain Coulomb's law of friction.
- 9 Define displacement, velocity, and acceleration.
- 10 Define kinetic energy.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

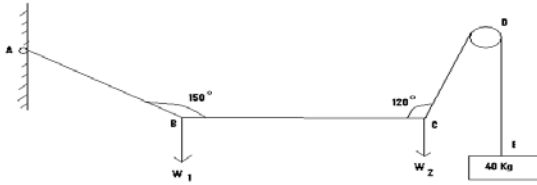
- 11 a. Two cables are tied together at 'N' and loaded as shown in figure. Determine the tension in cables MN and ON,



OR

P.T.O

- b. A fine light string ABCDE whose extremity 'A' is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth pulley at D carrying a weight of 40 kg at the free end E as shown in fig

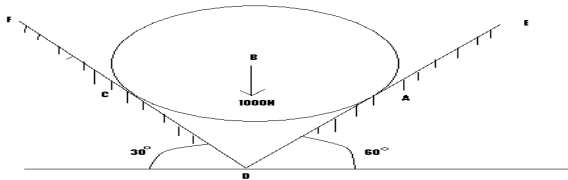


- 12 a. The following forces act at a point O.
- 10 N inclined 20° towards north east
 - 15 N towards north
 - 15 N towards north west and
 - 20N inclined at 30° towards south west

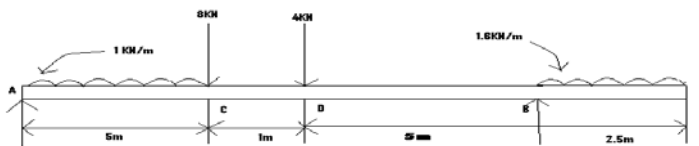
Find the magnitude and the direction of the resultant force by Analytical method.

OR

- b. A smooth circular cylinder of weight 1000N and the radius 100 mm rests in a right-angled groove whose sides are inclined at an angle of 30° and 60° to the horizontal as shown in the fig. Determine the reaction R_A and R_C at the points of contacts.



- 13 a. An overhanging beam carries the load as shown in the fig. Calculate the reaction at the both the ends

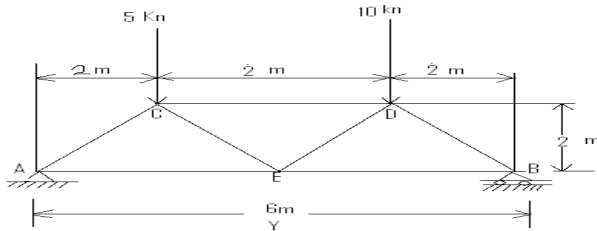


OR

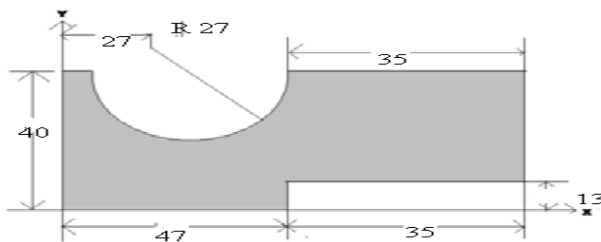
P.T.O
SL.NO:1319

3

- b. A plane truss is loaded and supported as shown in the fig. Determine the reaction at supports A and B.

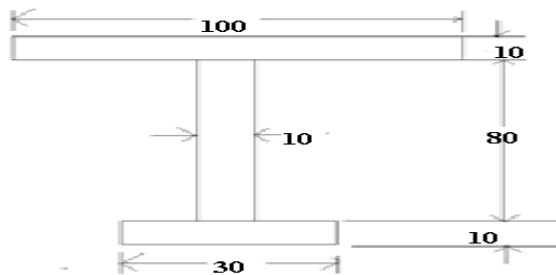


- 14 a. Determine the centroid of the shaded area shown in the fig. (All dimensions are in mm)



OR

- b. Determine the centroid of the given area shown in the fig. (All dimensions are in mm)



- 15 a. The pitch of a screw of a jack is 10mm and the mean diameter of the thread is 60mm and length of the lever is 500mm. Calculate the effort required to lift a load of 10KN. Take $\mu = 0.08$.

OR

- b. A screw jack carries a load of 4000 N. The mean diameter of the screw rod is 50mm and the pitch of the square threads is 20mm. If the Co-efficient of friction is 0.22, Calculate the torque required to raise the load, and the efficiency of the machine.
- 16 a. A car accelerates uniformly from a speed of 30 km/h to a speed of 75 km/h in 5 seconds. Determine the acceleration of the car and also the distance travelled during 5 seconds.

OR

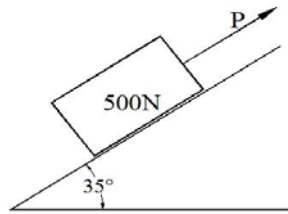
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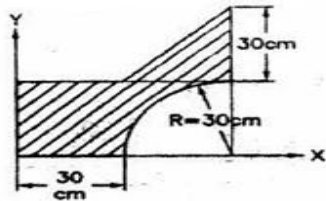
- b. A body starts with an initial velocity of 6 m/s and moves with a uniform acceleration of 1.5 m/s². Find the velocity of the body after 10 seconds. Also find the distance covered by the body in 10 seconds.
- 17 a. A projectile is projected at angle of 45° with the horizontal. The horizontal range of particle is 2 km. Find i) the velocity of projection, ii) the maximum height attained by the projectile.

OR

- b. A body of weight 500N is lying on a rough plane inclined at an angle of 35° with the horizontal. It is supported by a force, P parallel to the plane as shown in figure. Determine the minimum and maximum values of P, for which the equilibrium can exist, if the angle of friction is 20°

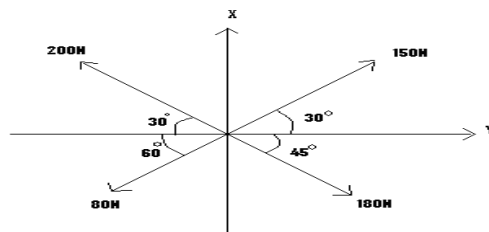


- 18 a. Determine the co-ordinates of centroid of the shaded area shown in figure.



OR

- b. Determine the resultant of system of forces acting as shown in Fig.



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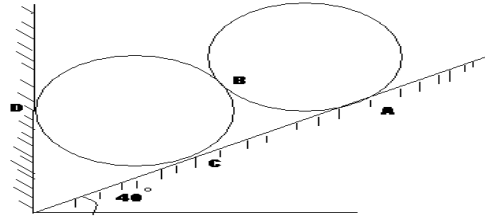
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5

Answer ALL questions

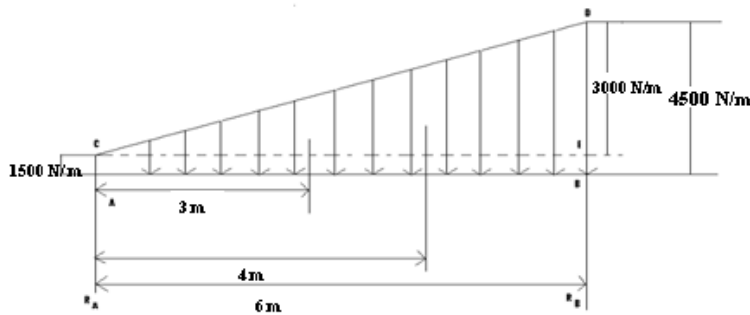
PART-C (2 x 15 = 30)

- 19 a. Two identical rollers each weighting 200N are placed in a trough as shown in fig. assuming all the surface of contact are smooth, find the reactions developed at the point of contact surfaces.

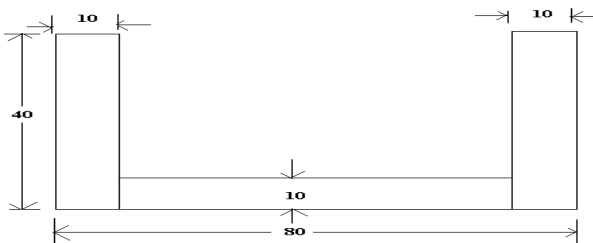


OR

- b. A simply supported beam of length 6 m, carries the uniformly increasing load of 1500 N/m at one end to 4500 N/m at the other end, as shown in the fig. determine the reactions at the supports.



- 20 a. Evaluate the moment of inertia of a T-section shown in the fig .about the X-X and Y-Y axis passing through C.G of the section. All dimensions are in mm



OR

- b. A 6m long ladder weighing 180 N is placed at 60° to the ground and is resting a vertical wall. The man weighs 700 N. The co-efficient of friction between the ladder and ground is 0.4 and that between the ladder and the wall is 0.25. How far the man can climb so that the ladder does not slip.

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SL.NO:1310

SUBJECT CODE:17PHBS08

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

FUNDAMENTALS OF NANO SCIENCE

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Differentiate SEM and TEM.
- 2 Restate about Quantum dots.
- 3 Describe multi-layered materials.
- 4 Explain the contamination time arise in Attritor milling.
- 5 Discuss sputtering and its types.
- 6 Describe about the pattern transferring in lithography.
- 7 Describe briefly about dip-pen lithography.
- 8 Discuss chemical contamination.
- 9 Discuss characterization of Nanomaterials.
- 10 Discuss the principle of SIMS.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Demonstrate the applications of Nanomaterials in various fields.
OR
b. Demonstrate the properties, synthesis methods and applications of multi-layered materials.
- 12 a. Demonstrate electro-deposition method for synthesis of nanostructures.
OR
b. Describe the sputtering technique in nanoparticle synthesis.
- 13 a. Illustrate the facilities and service required for the nano research laboratory.
OR
b. Demonstrate the construction and working of Scanning Probe Microscopy (SPM) with a neat sketch.

P.T.O

2

- 14 a. (i) Discuss the term Nano scale materials.(ii) Cite the characteristics of Nano scale materials.

OR

- b. Explain how the Optical, Thermal and Magnetic properties of Nanomaterials vary with geometry.

- 15 a. Explain in detail about the implications of Nanoscience and technology for Biology and Engineering.

OR

- b. Give an overview of photolithography.

- 16 a. Discuss e-beam lithography.

OR

- b. Differentiate wet and dry etching in lithography.

- 17 a. Discuss in brief about the preparation environment of Clean room.

OR

- b. Describe various factors that influence the selection of vibration isolators.

- 18 a. Discuss the working of ESCA with its applications and give its advantages and disadvantages.

OR

- b. Summarize the modes of Scanning Near field Optical Microscopy (SNOM) and its applications.

Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. (i) Classify Nanostructured materials with suitable examples. (ii)Analyze the effects of nanotization on the properties of materials.

OR

- b. Demonstrate the optical/UV lithography method of device fabrication.

- 20 a. Explain the properties, synthesis methods and applications of (i) Ultra-thin films (ii) Multi-layered materials.

OR

- b. Explain in detail various factors to be considered for a Clean room. Based on the above, provide the safety measures.

SL.NO:1310

SL.NO:1300

SUBJECT CODE:17MECC09

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

DESIGN OF MACHINE ELEMENTS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Identify the alloying element which improves the Hardenability of steels.
- 2 Describe shortly about Spindle.
- 3 List out the requirements of a shaft coupling.
- 4 Define a Turn buckle and where it is used.
- 5 Name the various types of springs.
- 6 Define Bearing.
- 7 Define Flywheel.
- 8 Summarize the classifications of machine design based on methods.
- 9 Describe shortly about the specification of couplings.
- 10 Summarize the required properties of bearing materials.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. An unknown weight falls from a distance of 15mm on to a collar rigidly attached to the lower end of a vertical bar 2.5m long and 500 mm² cross section. The maximum instantaneous extension is 2 mm .Determine the corresponding stress and the value of the weight falling. Take $E=2 \times 10^5 \text{ N/mm}^2$.

OR

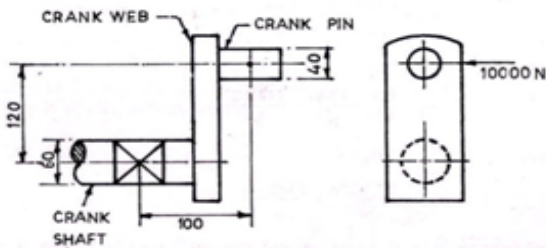
p.t.o

2

- b. Consider a plate subjected to a force of 60000N. The width of the plate is 60mm and diameter of the holes is 10mm. Determine the thickness of the plate, if the stress is not to exceed 150N/mm².



- 12 a. Determine maximum principal stresses and maximum shear stresses for a crankshaft loaded as shown in fig.



OR

- b. A factory line shaft is 4.5m long and is to transmit 75kW at 200rpm. The allowable stress in shear is 49MPa and the maximum allowable twist is 1° in a length of 20 diameters. Determine the required shaft diameter.
- 13 a. A flat plate of width 60mm has a central hole of 10mm diameter. If the plate is subjected to an axial tensile load of 10kN. Determine the thickness of plate. Assume the yield point stress 300MPa and factor of safety as 2.5.

OR

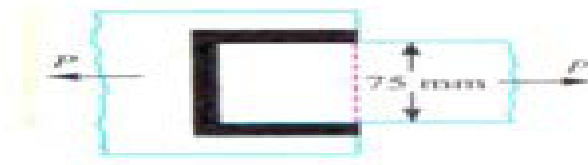
- b. Calculate the basic dimensions of a protective type flange coupling for the following requirements:
Power to be transmitted = 10kw, Speed of shaft = 960 rpm. Select suitable materials.
- 14 a. The cover of a pressure vessel is held in place by ten M20 bolts. The pressure is 1.4 MPa and the effective area of the exposed cover is 0.2 m². Ratio of bolt stiffness to parts stiffness is 1/4. Each bolt is tightened initially before the pressure is applied to 27 kN. Determine whether the joints will separate.

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OR

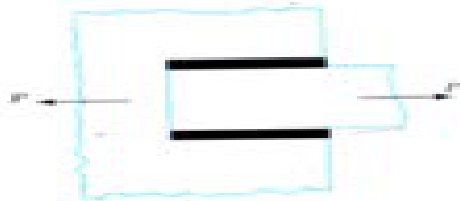
- b. A steel bolt M16x2 is 300mm long and carries an impact load of 5000N-mm. if the thread stops adjacent to the nut and $E=2.1 \times 10^5 \text{ Mpa}$, Determine a). The stress in root area
b). The stress if shank area is reduced to root area. What can be inferred from above case?

- 15 a. Calculate the size of the weld for the connection shown in figure below; if the tensile load P acting on the connection is 120kN. Assume permissible shear stress on the weld is 75Mpa.



OR

- b. A plate 60mm wide and 10mm thick is welded to another plate by two parallel fillet welds as shown in fig. Determine the safe load that the weld joint can carry. The allowable working stress in shear for weld material is 75 N/mm^2 .



- 16 a. A spring made from a wire of 1.25mm diameter and 750 N/mm^2 as its yield strength has a mean diameter of 12.5mm and 14 active coils. Calculate (i) Stiffness of spring (ii) Solid height assuming that the ends are squared and ground. Take the modulus of rigidity as $0.85 \times 10^5 \text{ N/mm}^2$

OR

- b. A torsion spring is made of 6mm monel metal wire wound with an inside diameter of 45mm, Assuming a safety factor, Calculate the (a) maximum force which can be applied with a 55mm leverage and (b) the corresponding deflection in degrees if spring has 4.5 coils.

p.t.o

- 17 a. Calculate the dimensions of a cantilever leaf spring to absorb 600N-m energy without exceeding a deflection of 150mm and a stress of 800 N/mm². The length of the spring is 600mm. The material of the spring is steel.

OR

- b. Calculate the dimensions of a suitable ball bearing to support the overhung countershaft. The shaft is 60mm diameter and rotates at 1250rpm. The bearings are to have 99% reliability corresponding to a life of 4000hrs. The bearing is subjected to an equivalent radial load of 6000N.
- 18 a. Determine the maximum tensile stress in the thin rim of a steel flywheel rotating at 600rpm. The mean radius of rim is 1500mm. The flywheel rim is 200mm thick and 300mm wide. The area of the cross section of the rim is 0.06m² and each of the six spokes is constant in cross section area of 0.01m². Also find the stress in each spoke.

OR

- b. A bolt is subjected to a tensile load of 25 KN and a shear load of 10 KN. Determine the diameter of the bolt according to:
- A. Maximum principal stress theory
 - B. Maximum principal strain theory
 - C. Maximum shear stress theory
- Assume factor of safety as 2.5, yield point stress in simple tension = 300N/mm² Poisson's ratio = 0.25.

Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. Determine the maximum stress induced in the following cases taking stress concentration into account.
- Case 1. A rectangular plate of 10mm thick and 50mm width with a hole of 20mm diameter under an axial load of 10 kN.
- Case 2. A circular shaft with a step under a bending moment of 50 Nm.

OR

- b. A cast iron cylinder head is fastened to a cylinder of 500mm bore with 8 stud bolts. The maximum pressure inside the cylinder is 2MPa. The stiffness of part is thrice the stiffness of the bolt. Determine the initial tightening load so that the joint is leak proof at maximum pressure? Also choose a suitable bolt for the above application.

20 a. Determine the dimensions of a leaf spring for a truck to the following specifications.

Total load on the springs = 140kN

Span of spring- =1000mm

Number of springs- = 4

Maximum number of leaves=10

Permissible tensile stress = 600N/mm²

Permissible deflection- = 80mm

Young's modulus of the spring = 200kN/mm²

Material for spring =Chromium Vanadium Steel

OR

b. The speed of a C.I flywheel is limited to 5 m/s at mean radius .The flywheel runs at 50rpm and supplied 12000 N-m energy during punching .The actual punching times occupies 30°rotations of wheel and speed drops by 20%. Determine the cross section of the rim and check the same for maximum induced stress.

SL.NO:1300

SL.NO:1293

SUBJECT CODE:17MEEC22

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
ELECTIVE - WASTE ENERGY CONVERSION
TECHNOLOGIES

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 How the wastes are separated?
- 2 Define MSW.
- 3 What are the types of composting methods?
- 4 State anaerobic composting.
- 5 What is pyrolysis?
- 6 Define the concept of recycling the waste.
- 7 What is MSW?
- 8 What is natural gas?
- 9 How the waste does harmful to environment?
- 10 What are the rules and regulations for BMW in India?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain in detail about the sources, types and composition of waste.
OR
b. What are the types of waste and explain its presence in pie chart.
- 12 a. Discuss about recycling processes solid waste.
OR
b. Explain the methods adopted in minimizing and recycling of MSW.
- 13 a. What are the types of incinerators and explain any one type in detail.
OR
b. Discuss in detail about methods and sitting considerations of landfilling process.
- 14 a. Discuss in detail about medical and pharmaceutical waste incinerations.
OR
b. Explain the advantages and health impacts of incineration process in detail.

p.t.o

15 a. Compare between pyrolysis and incineration processes explain in detail.

OR

b. Discuss in detail about the recycling process from waste.

16 a. Explain in detail about anaerobic digestion of sewage.

OR

b. Describe about refuse-derived fuel and industrial waste.

17 a. Describe about production and utilization of landfill gas.

OR

b. Discuss in detail of any one case study of commercial waste to energy plants.

18 a. Describe in detail about the eco-technological alternatives for waste to energy conversions in India

OR

b. Explain the rules and regulations formulated for handling and disposal of BMW in India

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Draw and explain in details with a neat flow chart about waste processing methods.

OR

b. Explain with diagram on methods, siting considerations, layout and preliminary designs of landfill.

20 a. Describe about the strategies involved in reducing the environmental and health impacts of incineration and pyrolysis process.

OR

b. Discuss in detail about biogas production from anaerobic digesters and with a neat sketch explain any two types of biogas digesters.

SL.NO:1288

SUBJECT CODE:17MBHS09

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

**INTELLECTUAL PROPERTY RIGHTS AND ALTERNATE DISPUTE
RESOLUTION**

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Mention the essential characteristics of an industrial design
- 2 List four types of intellectual properties.
- 3 Define intellectual property in technology
- 4 Define patents.
- 5 What are the infringement actions
- 6 What rights does a patent provide?
- 7 Is a patent valid in every country?
- 8 How does copyright differ from patent and trademark law?
- 9 What is trade secret and how is it protected?
- 10 What do you understand by IPR strength in India

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Illustrate the following i) Copyright ii) Trademarks
OR
b. Demonstrate briefly International Treaties and Conventions on IPRs
- 12 a. Formulate and explain IPR in India and abroad and its limitations. Outline the steps in nature of IP.
OR
b. Discuss various IP rights.
- 13 a. Explain the procedure to select and evaluate trademarks
OR
b. Explain the Digital Content Protection

(p.t.o)

14 a. Elucidate in which way does WTO differ from WIPO with suitable example.

OR

b. Explain the trading norms of WTO towards IPR

15 a. Explain the differences between Trademark and Geographical Indication Act.

OR

b. Discuss the principles of Copyright Act.

16 a. Elaborate the role of IPR in protection against unfair competition

OR

b. Describe the following: i) Copyright ii) Patent iii) Trademark

17 a. Explain the evolution of IP regime in India with suitable examples.

OR

b. Discuss International Patent Law

18 a. Discuss the patent ownership.

OR

b. Discuss on Design Act.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Define patent and the application process in detail with illustration

OR

b. Compare and contrast the emerging issues of IPR and discuss new developments and International Patent Law

20 a. Write examples for TRIPs agreement and Summarize enforcement measures in IPR with suitable example

OR

b. Explain the evolution of IP regime in India and formulate the structure of IP licensing and Indian competition law with examples

SL.NO:1276

SUBJECT CODE:17MECC15

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

FINITE ELEMENT ANALYSIS

Time : Three Hours

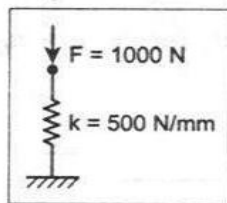
Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define Global co-ordinates?
- 2 Name any Four FEA software's.
- 3 Define finite element analysis?
- 4 Define Traction Force (T).
- 5 Define shape function.
- 6 State Glaerkin's method.
- 7 Define LST element.
- 8 Define temperature effects.
- 9 What do you mean by higher order element?
- 10 List the purpose of isoparametric elements?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. A linear elastic spring is subjected to a force of 1000N as shown in Fig. Calculate the displacement and the potential energy of spring.



OR

- b. Solve following system of equations using Gauss elimination method.
- $$x_1 - x_2 + x_3 = 1$$
- $$-3x_1 + 2x_2 - 3x_3 = -6$$
- $$2x_1 - 5x_2 + 4x_3 = 5$$

(P.T.O)

- 12 a. Solve following system of equations using Gauss elimination method.

$$2X_1 + 4X_2 + 2X_3 = 15$$

$$2X_1 + X_2 + 2X_3 = -5$$

$$4X_1 + X_2 - 2X_3 = 0$$

OR

- b. The following differential equation is available for a physical phenomenon.

$$d^2y/dx^2 + 50 = 0, 0 < x < 10$$

$$\text{Trial function is, } y = a_1 x (10 - x)$$

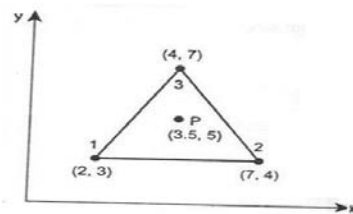
$$\text{Boundary conditions are, } y(0) = 0$$

$$y(10) = 0$$

Find the value of the parameter a_1 by the following methods:

- (i). Point collocation (ii) Least squares

- 13 a. Determine the shape functions N_1 , N_2 , and N_3 at the interior point P for the triangular element shown in fig.



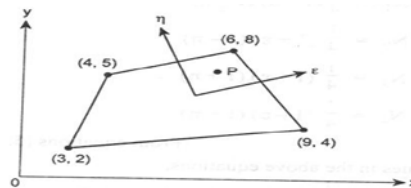
OR

- b. Evaluate the integral by using Gaussian quadrature $\int_{-1}^1 x^2 dx$.

- 14 a. Evaluate the integral by applying 3 point Gaussian quadrature. $\int_{-1}^1 \cos \frac{x}{2} dx$

OR

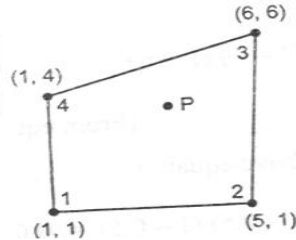
- b. Evaluate the Cartesian co-ordinate of the point P which has local co-ordinates $\xi = 0.6$ $\eta = 0.8$ as shown in fig



(P.T.O)

SL.NO:1276

- 15 a. For the Isoparametric four noded quadrilateral element shown in fig. Determine the Cartesian co-ordinates of point P which has local co-ordinates $e = 0.5$ and $h = 0.5$.



OR

- b. Derive the temperature distribution in circular pin ($\phi = 1\text{mm}$ and length = 50mm) one end at 300°C and end is free. Assume $K = 200\text{W/M}^2\text{C}$ and $T_\infty = 30^\circ\text{C}$
- 16 a. A steel rod of diameter $d = 2\text{cm}$, length $l = 5\text{cm}$ and thermal conductivity $k = 50\text{W/m}^\circ\text{C}$ is exposed at one end to a constant temperature of 320°C . The other end is in ambient air of temperature 20°C with a convection coefficient $h = 100\text{W/M}^2\text{C}$. Determine the temperature at the midpoint of the rod.

OR

- b. Calculate the temperature distribution in a one dimension fin with physical properties given in the fig. The fin is rectangular in shape and is 120mm long and 40mm wide and 10mm thick. Assume that convection heat loss occurs from the end of the fin. Use two elements. Take $k = 0.3\text{W/mm}^2\text{C}$, $h = 1 \times 10^{-3}\text{W/mm}^2\text{C}$, $T_\infty = 20^\circ\text{C}$



- 17 a. A metallic fin, with thermal conductivity $K = 360\text{W/m}^\circ\text{C}$, 0.1cm thick and 10cm long, extends from a plane wall whose temperature is 235°C . determine the temperature distribution and amount of heat transferred from the fin to the air at 20°C with $h = 9\text{W/m}^2\text{C}$. take width of the fin to be 1m .

OR

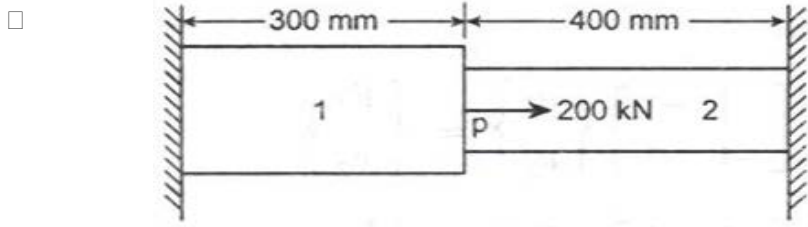
- b. Derive stress strain relationship matrix for two dimensional elements.
- 18 a. Explain in detail: Weighted residual methods.

OR

- b. Extend the expression for the stiffness matrix in finite element method.

Answer ALL questions**PART-C (2 x 15 = 30)**

- 19 a. Consider a bar as shown in fig. An axial load of 200 kN is applied at point P. Take $A_1 = 2400 \text{ mm}^2$, $E_1 = 70 \times 10^9 \text{ N/m}^2$, $A_2 = 600 \text{ mm}^2$, $E_2 = 200 \times 10^9 \text{ N/m}^2$. Calculate the following: (a) The nodal displacement at point P. (b) Stress in each material. (c) Reaction.

**OR**

- b. The following differential equation is available for a physical phenomenon.

$$d^2y/dx^2 + 500x^2 = 0, \quad 0 < x < 1$$

Trial function is, $y = a_1(x-x_3) + a_2(x-x_5)$

Boundary conditions are, $y(0) = 0$

$$y(10) = 0$$

Find the value of the parameter a_1 by the following methods:

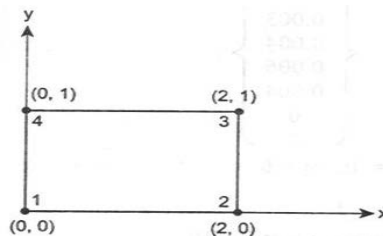
- (i) Subdomain collocation; (ii) Galerkin method.

- 20 a. A four noded rectangular element is shown in fig. Determine the following.

- i. Jacobian matrix ii. Strain-Displacement matrix; iii. Element stresses.

Take $E = 2 \times 10^5 \text{ N/mm}^2$; $\gamma = 0.25$ $u = [0, 0, 0.003, 0.004, 0.006, 0.004, 0, 0]^T$ $e = 0$ and $h = 0$.

Assume plane stress condition

**OR**

- b. Consider the isoparametric quadrilateral element with nodes 1 to 4 at (5,5), (11,7), (12,5) & (4,10) respectively. Estimate the jacobian matrix

SL.NO:1269

SUBJECT CODE:17MECC08

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

DYNAMICS OF MACHINES

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Examine what is the equivalent spring stiffness?
- 2 Define the term Co-efficient of fluctuation of speed.
- 3 Define tractive force.
- 4 State how governors are classified?
- 5 Define power of governor
- 6 Define controlling force.
- 7 Differentiate a flywheel from a governor.
- 8 Summarise the methods for force balancing of linkages?
- 9 Determine the principle of Rayleigh's method of finding natural frequency of vibrations?
- 10 State the conditions for dynamic balancing.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. The crank and connecting rod of a reciprocating engine are 200 mm and 700mm respectively. The crank is rotating in clockwise directions at 120 rad/sec. Find with the help of Klein's constructions: 1. Velocity and accelerations of the piston, 2. Velocity and accelerations of the mid point of the connecting rod and 3. Angular velocity and angular accelerations of the connecting rod, at the instant when the crank is at 30° to I.D.C.

OR

- b. A single cylinder vertical engine has a bore of 300mm and a stroke of 400mm. The connecting rod is 1000mm long. The mass of reciprocating parts is 140Kg. On the expansion stroke with the crank at 30° from the TDC, the gas pressure is 0.7MPa. If the engine runs at 250rpm determine (i) Net force acting on the piston (ii) Resultant load on the gudgeon pin (iii) Thrust on the cylinder walls (iv) The speed above which other things remaining same the gudgeon pin loads would be reversed in direction

(P.T.O)

12 a.

A single cylinder internal combustion engine working on the four stroke cycle develops 75 KW at 360 r.p.m. The fluctuation of energy can be assumed to be 0.9 times the energy developed per cycle. If the fluctuation of speed is not to exceed 1% either way from the mean speed and the maximum centrifugal stress in the flywheel is to be 5.5 MPa, estimate the mean diameter and the cross-sectional area of the rim. The material of the rim has density of 7.2 Mg/m^3 .

OR

b.

Four masses m_1 , m_2 , m_3 and m_4 are 200Kg, 300Kg, 240Kg and 260Kg respectively. The corresponding radii of rotation are 0.2m, 0.15m, 0.25m and 0.3m respectively and the angles between successive masses are 45° , 75° and 135° . Find the position and magnitude of the balance mass required if its radius of rotation is 0.2m.

13 a.

A single cylinder reciprocating engine has speed 240rpm, Stroke 300mm, mass of reciprocating parts 50Kg, mass of revolving parts at 150mm radius and 37Kg. If two-third of the reciprocating parts and all the revolving parts are to be balanced, find 1. The balance mass required at a radius of 400 mm, and 2. The residual unbalanced unbalance force when the crank has rotated 60° from TDC.

OR

b.

A four cylinder vertical engine has crank 150 mm long. The planes of rotation of the first, second and fourth cranks are 400 mm, 200 mm and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine may be in complete primary balance.

14 a. Describe with line sketch a universal dynamic balancing machine indicating how balanced masses use found out.

OR

b.

A shaft of diameter 10 mm carries at its centre a mass of 12 kg. It is supported by two short bearings, the centre distance of which is 400 mm. Find the whirling speed: (a) Neglecting the mass of the shaft, and (b) considering the mass of the shaft. The density of shaft material is 7500 kg/m^3 . Take $E=200 \text{ GN/m}^2$.

15 a.

A vibrating system consists of a mass of 8 kg, spring of stiffness 5.6 N/mm and a dashpot of damping coefficient of 40 N/m/s. Find: (a) the critical damping coefficient, (b) the damping factor, (c) the natural frequency of damped vibration, (d) the logarithmic decrement, (e) the ratio of two consecutive amplitude, and (f) the number of cycle after which the original amplitude is reduced to 20 percent.

(P.T.O)

SL.NO:1269

3
OR

b.

A machine 100kg has a 20kg rotor with 0.5mm eccentricity. The mounting springs have $S = 85 \times 10^3$ N/m. The damping ratio is 0.02. The operating speed is 600 rpm and the unit is constrained to move vertically. Find: dynamic amplitude of the machine and the force transmitted to the supports.

16 a.

A mass of 50 Kg suspended from a spring produces a static deflection of 17mm and when in motion it experiences viscous damping force of value 250N at a velocity of 0.3m/s. Calculate the periodic time of damped vibration. If the mass is then subjected to a periodic disturbing force having a maximum value of 260N and making 2cycles/s, find the amplitude of ultimate motion.

OR

b.

A body of mass 20 Kg is suspended from a spring which deflects 15mm under this load. Calculate the frequency of free vibrations and verify that a viscous damping force amounting to approximately 1000N at a speed of 1m/s is just sufficient to make the motion a periodic.

17 a.

An industrial machine weighing 445kg is supported on a spring with a static deflection of 0.5cm. If the machine has rotating imbalance of 25kg-cm; determine the force transmitted at 1200 r.p.m and the dynamic amplitude at the speed.

OR

b.

A Proell governor has equal arms of length 300mm. The upper and lower ends of the arms are pivoted on the axis of the governor. The extension arms of the lower links are each 80mm long and parallel to the axis when the radii of rotation of the balls are 150mm and 200mm. The mass of each ball is 10kg and the mass of the central load is 100kg. Determine the range of speed of the governor.

18 a.

An aero plane makes a complete half circle of 50 meter radius to the left, when flying at 200 km/hr. The rotary engine and the propeller of the plane has a mass of 400kg and radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m clock wise when viewed from the rear. Find gyroscopic couple on the aircraft and state its effect on it. Show gyroscopic couple effect by sketch.

OR

b.

An engine flywheel has a mass of 6.5 tonnes and the radius of gyration is 2m. If the maximum and minimum speeds are 120rpm and 118rpm respectively find the maximum fluctuation of energy.

(P.T.O)
SL.NO:1269

Answer ALL questions**PART-C (2 x 15 = 30)**

19 a.

The lengths of crank and connecting rod of a horizontal reciprocating engine are 200 mm and 1.0 m respectively. The crank is rotating at 400 r.p.m. When the crank has turned 30° from the inner dead centre, the difference of pressure between the cover end and piston end is 0.4N/mm^2 . If the mass of the reciprocating parts is 100kg and cylinder bore is 0.4m, then calculate: (i) Inertia force, (ii). Force on piston, (iii). Piston effort, (iv) Thrust on the sides of cylinder walls, (v) Thrust in the connecting rod, (vi) Crank effort and (vii) Turning moment on the crank shaft. Neglect the effect of piston rod diameter and frictional resistance.

OR

b.

A two cylinder uncoupled locomotive has inside cylinders 0.6 m apart. The radius of each crank is 300 mm and is at right angles. The revolving mass per cylinder is 250 kg and the reciprocating mass per cylinder is 300 kg. The whole of the revolving and two-third of the reciprocating masses are to be balanced and the balanced masses are to be placed, in the planes of rotation of the driving wheels a radius of 0.8 m. The driving wheel is are 2 m in diameter and 1.5 m apart. If the speed of the engine is 80 km/hr, determine hammer blow, maximum variation in tractive force, and maximum swaying couple.

20 a. The flywheel of an engine driving a dynamo has mass of 180 kg and has a radius of gyration of 30mm. The shaft at the flywheel end has an effective length of 250 mm and is 50 mm diameter. The armature mass is 120 kg and has a radius of gyration of 22.5mm. The dynamo shaft has a diameter of 43mm and an equivalent length of 200 mm. neglecting the inertia of the shaft and coupling, calculate the frequency of the torsional vibrations and position of node. The modulus of rigidity for the shaft material is 80 G/Nm².

OR

b. A single cylinder vertical petrol engine of total mass 300kg is mounted upon a steel chassis frame and caused a vertical static deflection of 3.4 mm. The reciprocating parts of engine have a mass of 15kg and move through a vertical stroke of 150 mm with S.H.M. A dashpot is provided, the damping resistance of which is directly proportional to the velocity and amounts to 1000 N/m/s. Determine :(a). the speed of the driving shaft at which resonance will occur, and (b). the amplitude of steady state forced vibrations when the driving shaft of the engine rotates at 400 r.p.m.

SL.NO:1265

SUBJECT CODE:17MECC07

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

THERMAL ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List the different components of a steam power plant working on Rankine cycle.
- 2 List out the effects of friction on the flow through a steam nozzle.
- 3 List the factors that affect air standard efficiency of a Diesel cycle.
- 4 Define Cetane number. List its significance.
- 5 List four significant properties of a good refrigerant.
- 6 List the various components used of a simple vapour absorption system.
- 7 State the general comfort conditions during summer and winter.
- 8 What is dry air and moist air?
- 9 Indicate the application of reciprocating compressors in industry.
- 10 When do the dry bulb, wet bulb and dew point temperatures become equal?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. A steam power plant is supplied with dry saturated steam at a pressure of 12 bar and exhausts into a condenser at 0.1 bar. Calculate the Rankine efficiency.

OR

- In an Otto cycle, air at 1 bar and 290K is compressed isentropically until the pressure is 15 bar. The heat is added at constant volume until the pressure rises to 40 bar, calculate the air standard efficiency and the mean effective pressure for the cycle, take $C_v = 0.717 \text{ kJ/kgK}$ and $R_{univ} = 8.314 \text{ kJ/kg mole K}$.
- b.

- 12 a. A closed cycle gas turbine unit operating with maximum and minimum temperatures of 700°C and 15°C has a pressure ratio of 8:1. Calculate the ideal cycle efficiency and the work ratio.

OR

- b. Derive the expression of COP of reversed Carnot cycle.

p.t.o

The sling psychrometer in a laboratory test recorded the following readings :

Dry bulb temperature = 35°C : Wet bulb temperature = 25°C.

Calculate the following :

- 13 a. (i) Specific humidity (ii) Relative humidity.
 (iii) Vapour density in air (iv) Dew point temperature.
 (v) Enthalpy of mixture per kg of dry air.
 Take atmospheric pressure = 1.0132 bar.

OR

- b. Which type of air – conditioner system is suitable for your college auditorium? Why? Explain with details.
- 14 a. Explain the method of pressure compounding in a steam turbine. What are its benefits?

OR

- b. Compare between Impulse turbine and Reaction turbine.
- 15 a. Compare Otto, Diesel and Dual Cycles and distinct them.

OR

- b. Describe the working principle of simple carburetor, with a neat sketch
- 16 a. Explain lubrication system of an internal combustion engine.

OR

- b. Explain the construction and working of a sliding vane compressor and axial flow compressor.
- 17 a. How does the practical vapour compression refrigeration cycle differ from ideal basic vapour compression refrigeration cycle? Explain it.

OR

- b. Describe vapour absorption refrigeration in Ammonia –water system with neat sketch.
- 18 a. Describe the working of a winter air-conditioning system. with a neat sketch.

OR

- b. Explain the different types of Air Distribution systems.

Answer ALL questions

PART-C (2 x 15 = 30)

In a Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Determine :

- 19 a. (i) The pump work, (ii) The turbine work, (iii) The Rankine efficiency, (iv) The condenser heat flow, (v) The dryness at the end of expansion. Assume flow rate of 9.5 kg/s.

OR

- b. Derive an expression for the volumetric efficiency of reciprocating air compressors and explain why it is less than unity.

The moist air is at 45°C dry bulb temperature and 30°C wet bulb temperature.

Calculate:

- 20 a.
- a) Vapour pressure
 - b) Dew point temperature
 - c) Specific enthalpy
 - d) Relative humidity
 - e) Degree of saturation
 - f) Vapour density
 - g) Enthalpy of mixture.

OR

- b. Explain with the help of neat diagram a Regenerative cycle with double feed heaters. Also derive the expression for its thermal efficiency.

SL.NO:1265

SL.NO:1258

SUBJECT CODE:17MECC04

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
MANUFACTURING TECHNOLOGY

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Tell the use of back rake angle cutting tool.
- 2 Define tool life.
- 3 List the significance of a semi automatic lathe.
- 4 List the speciality of a slotter in comparison to a shaper.
- 5 List the various broaching operations.
- 6 Define center less grinding.
- 7 Define truing.
- 8 Differentiate orthogonal and oblique cutting.
- 9 Discuss sensitive hand feed.
- 10 Differentiate band saw and reciprocating saw.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Illustrate the nomenclature of a single point cutting tool with sketches.
OR
b. Examine the factors affecting tool life in detail.
- 12 a. Demonstrate the working principle of swiss type automatic lathe with suitable sketch
OR
b. Illustrate work holding devices applicable in lathe with a neat sketch.
- 13 a. Illustrate the various milling operations. Explain any four with neat sketch.
OR
b. Demonstrate the various types of gear finishing operations.
- 14 a. Illustrate with neat sketch, the working principle of circular saw.
OR
b. Illustrate the process of reconditioning of grinding wheels in detail.
- 15 a. Explain the properties of good cutting fluid.

p.t.o

OR

b. Explain the nomenclature of twist drill and define the various elements of twist drill.

16 a. Differentiate and contrast the shaper with planer.

OR

b. Discuss the classification of a broaching operation and explain in detail.

17 a. List the various broach tools? Explain with neat sketches.

OR

b. Explain the lapping process in detail.

18 a. Explain the various types of chucks with neat sketch.

OR

b. Explain the different types of cutting tools used in lathe.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Demonstrate the working principle of turret lathe with a neat sketch.

OR

b. Differentiate different types of continuous broaching machine and explain with neat sketch.

20 a. Demonstrate the with neat sketch, the working of principle of gear hobbing process.

OR

b. Discuss with neat sketch, the working of vertical boring machine.

SL.NO:1258

SL.NO:1242

SUB CODE: 17MABS11

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
COMMON TO MECHANICAL AND AUTO

NUMERICAL METHODS FOR MECHANICAL SCIENCES

(Candidates admitted under 2017 Regulations-SCBCS)

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is meant by diagonally dominant?
- 2 Write *Gauss elimination method* to solve $AX = B$.
- 3 When *Bessel's* formula is to be used?
- 4 Write the second order divided difference formula.
- 5 Write the basic principle for deriving *Simpson's* $\frac{1}{3}$ Rule.
- 6 What is the Truncation error in *Trapezoidal rule*?
- 7 Mention modified Euler algorithm to solve $\frac{dy}{dx} = f(x, y)$, $y(x_0) = y_0$ at $x = x_0 + h$
- 8 Write down Euler algorithm to the differential equation $\frac{dy}{dx} = f(x, y)$
- 9 Write *Bender-Schmidt scheme* to solve $\frac{\partial^2 u}{\partial x^2} = \frac{1}{\alpha^2} \frac{\partial u}{\partial t}$
- 10 What is point wise solution of a differential equation?

P.T.O

Answer Any FIVE questions
Part-B (5 x10 =50 Marks)

11 a.

Solve $e^x - 4x = 0$ by Newton's Method.

OR

b.

Find a real root of $x^3 - 9x + 1 = 0$ that lies between 2 and 3 by the Method of False position, correct to 3 decimal places.

12 a.

Solve the following system of equations by Gauss Jacobi method

$$10x - 2y + z = 12$$

$$x + 9y - z = 10$$

$$2x - y + 11z = 20$$

OR

b.

Using *Newton's Divided Difference Formula* to find the value of $\log_{10} 656$. Given

$\log_{10} 654 = 2.8156$, $\log_{10} 658 = 2.8182$, $\log_{10} 659 = 2.8189$, and $\log_{10} 661 = 2.8202$.

13 a.

From the following table values of x and $f(x)$, determine $y(42)$

x	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

OR

b.

Apply *Lagrange's* formula inversely, to obtain the root of the equation $f(x) = 0$ given that

$f(0) = -4$, $f(1) = 1$, $f(3) = 29$ and $f(4) = 52$.

P.T.O
SL.NO:1242

- 14 a. Identify first and second derivatives of the function y at the point $x = 1.2$ using the following data.

x	1	2	3	4	5
y	0	1	5	6	8

OR

- b. Identify the first two derivatives of y at $x = 54$ from the following data.

x	50	51	52	53	54
y	3.6840	3.7084	3.7325	3.7563	3.7798

- 15 a.

Use of *Romberg's method*, to compute $I = \int_0^1 \frac{dx}{1+x}$ correct to 4 decimal places. Hence find $\log_e 2$.

OR

- b. Solve $\frac{dy}{dx} + y - x^2 = 0$, $y(0.2) = 0.8213$, Find $y(0.3)$ correct to four decimal places by using *Modified Euler's method*.

- 16 a.

Use the Taylor series method, to find approximate values of y and z corresponding to $x = 0.1$, given that $y(0) = 2, z(0) = 1$ by solving $\frac{dy}{dx} = x + z$ and $\frac{dz}{dx} = x - y^2$.

OR

- b. Apply the *Runge-Kutta method*, tabulate the solution of the system $\frac{dy}{dx} = x + z, \frac{dz}{dx} = x - y$, $y(0) = 0, z(0) = 1, h = 0.1$. Find $y(0.1), z(0.1)$

- 17 a.

Solve the equation $y'' - xy = 0$ given $y(0) = -1, y(1) = 2$ by finite difference method taking $n=2$.

4

OR

b.

Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, $0 \leq x \leq 1$, $t \geq 0$ with $u(x,0) = x(1-x)$, $0 < x < 1$ and

$u(0,t) = 0 = u(1,t)$, $\forall t > 0$ using explicit method with $\Delta x = 0.2$ for three steps.

18 a.

Solve numerically $u_{tt} = 4u_{xx}$ with boundary conditions $u(0,t) = 0 = u(4,t)$, $u_t(x,0) = 0$ and $u(x,0) = x(4-x)$

OR

b.

Using the Simpson's rule, evaluate $\int_1^2 \int_1^2 \frac{1}{x+y} dx dy$ by dividing into two equal sub intervals.

Answer ALL questions
PART-C (2 x 15 = 30)

19 a.

Using *Gauss – Jordan* method to solve the following system.

$$x + 2y + z = 3$$

$$2x + 3y + 3z = 10$$

$$3x - y + 2z = 13$$

OR

b.

Given the data

x	0	1	2	3	4
y	2	3	12	35	78

Construct the cubic polynomial of x , using *Newton's Backward Interpolation formula*.

P.T.O

SL.NO:1242

5

20 a.

Identify the first, second and third derivatives of $f(x)$ at $x=1.5$ if

x	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3.375	7.000	13.625	24.000	38.875	59.000

OR

b.

Using *Modified Euler method*, Find $y(0.1)$, $y(0.2)$, given $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$.

SL.NO:1242

SL.NO:1241

SUBJECT CODE:17MEEC31

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-ENGINEERING MECHANICS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List the conditions of equilibrium of a particle in plane.
- 2 Define moment of inertia of a body.
- 3 Define principal moment of inertia.
- 4 Define the efficiency of the screw jack.
- 5 Write the equation relating angular displacement and linear displacement.
- 6 Define particle in space.
- 7 Explain equilibrium conditions for rigid bodies.
- 8 Three concurrent forces are acting on body. Discuss the condition for static equilibrium.
- 9 Explain open and cross belting.
- 10 Discuss the type of thread is used in screw jack

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

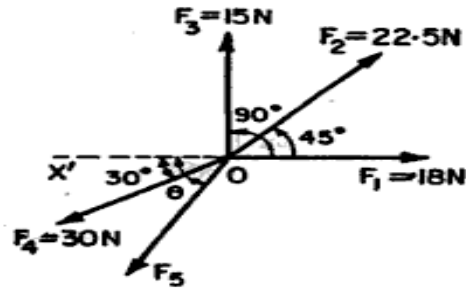
- 11 a. The resultant of the two forces when they act at right angles is 10kN, whereas they act at an angle of 60° , the resultant is 12kN. Determine the magnitude of the two forces.

OR

- b. A force has components $F_x = 100$ N; $F_y = 65$ N ; $F_z = -80$ N. Find the magnitude of the resultant force and the angle θ_x , θ_y and θ_z from the axis X, Y and Z.

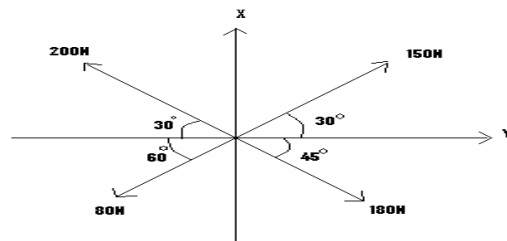
p.t.o

- 12 a. The five forces F_1 , F_2 , F_3 , F_4 and F_5 are acting at a point on a body as shown in fig. And the body is in equilibrium, if $F_1 = 18\text{ N}$, $F_2 = 22.5\text{ N}$, $F_3 = 15\text{ N}$ and $F_4 = 30\text{ N}$, find the forces F_5 in magnitude and direction.

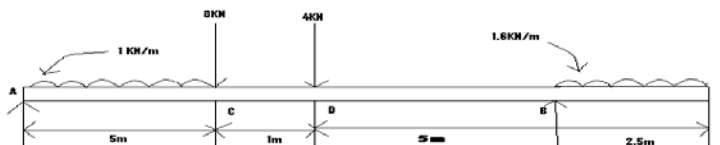


OR

- b. Determine the resultant of system of forces acting as shown in Fig.

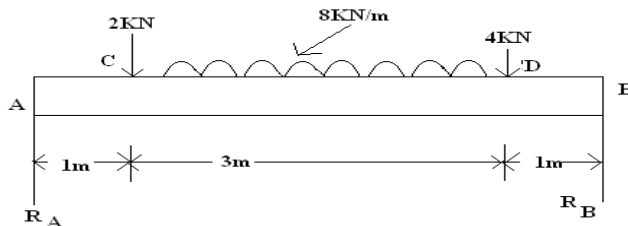


- 13 a. An overhanging beam carries the load as shown in the fig. Calculate the reaction at the both the ends

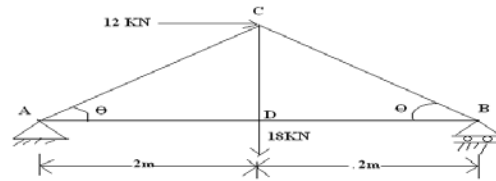


OR

- b. Solve the A simply supported beam of length 5 m, carries the uniformly distributed load and the two point load as shown in the fig. calculate the reactions R_A and R_B .

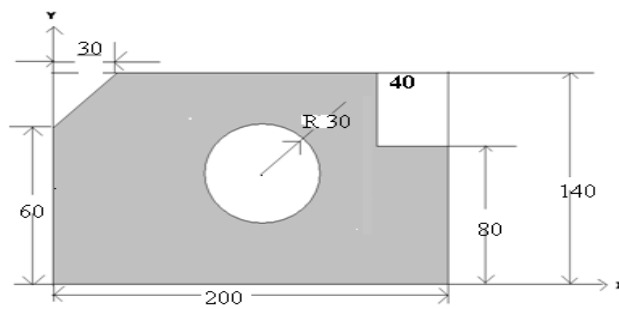


- 14 a. Determine the reaction at supports A and B of the truss as shown in the fig.

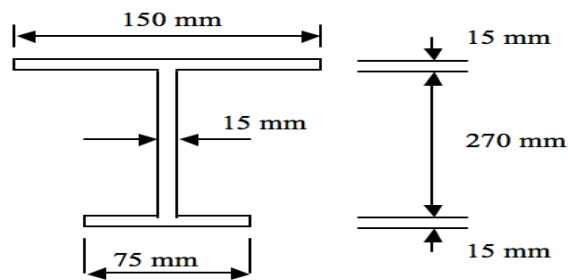


OR

- b. Determine the centroid of the shaded area shown in the fig. Assume circle is in centre of the rectangle (All dimensions are in mm)

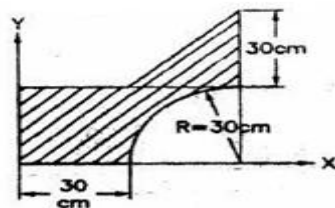


- 15 a. Determine the centroid of the given section shown in the fig. (All dimensions are in mm)



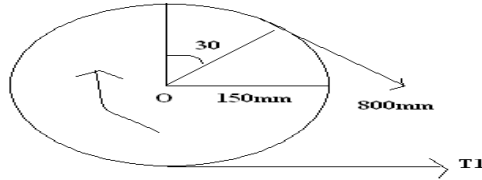
OR

- b. Determine the co-ordinates of centroid of the shaded area shown in figure.



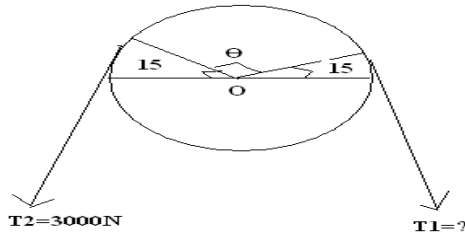
4

- 16 a. A pulley is driven by a belt in clockwise direction as shown in the fig. If the tension in the belt on the tight side is 800 N, find the tension in the belt on the slack side. Also find the torque exerted by the belt on the pulley. Take $\mu = 0.3$



OR

- b. A belt is wound over a pulley as shown in fig. If the tension in the belt on one end is 3000N, what is the necessary tension on the other side of the belt to resist? Take $\mu = 0.25$



- 17 a. A pulley is driven by a flat belt running at a speed of 600m/min. the co-efficient of friction between the pulley and the belt is 0.3 and the angle of lap is 160° . If the maximum tension in the belt is 700N. Find the power transmitted by the belt.

OR

- b. A car starts from rest and attains a velocity of 40 km/hr in 3 minutes with uniform acceleration. Calculate i) acceleration of car, ii) distance travelled in 3 minutes, iii) time required to reach velocity of 25 km/hr.
- 18 a. A stone is dropped into a well and heard the sound to strike the water after 4 seconds. Find the depth of the well, if the velocity of sound is 350 m/sec.

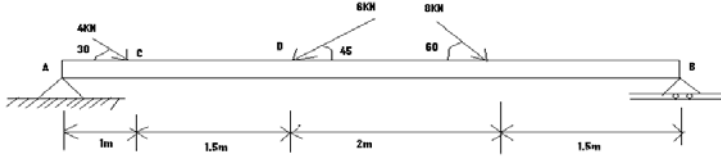
OR

- b. A car is moving with a velocity of 12 m/sec. The car is brought to rest by applying brakes after 6 seconds. Find, i) retardation of the car after apply the brakes, ii) distance travelled by the car after applying brakes.

Answer ALL questions

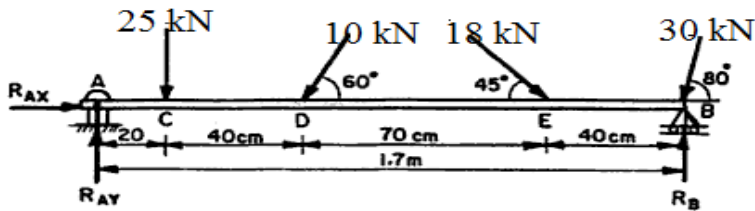
PART-C (2 x 15 = 30)

- 19 a. A beam AB of span 6m is hinged at A and supported on rollers at end B and carries the load as shown in the fig. Determine the reaction at A and B.

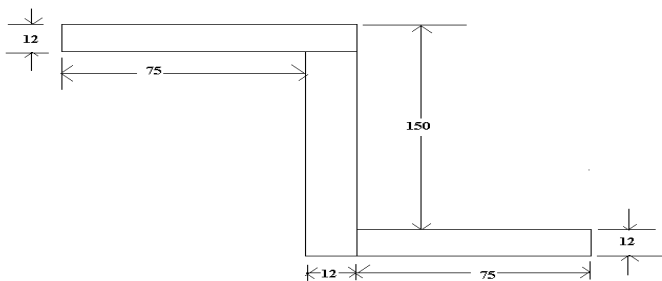


OR

- b. A beam AB of span 1.7 m is hinged at A and supported on rollers at end B and carries the load as shown in the fig. Determine the reaction at A and B.



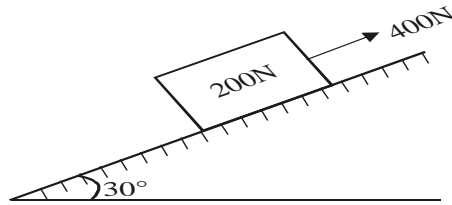
- 20 a. Determine the moment of inertia about its centroidal axis of the Z section shown in the fig.



OR

6

- b. A body weighing 200 N is pushing up a 30° plane by a force of 400 N acting parallel to the plane. If the initial velocity of the body is 1.5 m/sec and $\mu = 0.2$, what velocity will the body have after moving 5 m?



SL.NO:1241

SL.NO:1239

SUBJECT CODE:17MTCC01

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHATRONICS

PROGRAMMABLE LOGIC CONTROLLER

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Compare the analog and digital I/O modules.
- 2 Which is the most popular language for programming PLCs? Why?
- 3 State the output control devices.
- 4 Define programming languages
- 5 Name and draw the symbol for Retentive timer
- 6 Explain coil formatted Counter instruction
- 7 Give the merits of basic PLC instruction.
- 8 Draw the ladder logic diagram for EX-OR gate.
- 9 Define process control system.
- 10 Mention the sensors used in Automatic car washing machine.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain in detail about the block diagram of Programmable Logic Controller.
OR
b. Explain in detail about the basic circuit of discrete I/O module and also its applications
- 12 a. Illustrate the PLC vs. Computers
OR
b. Illustrate the operating principle of an electromagnetic control relay.
- 13 a. Describe the construction and working principle of contactor.
OR
b. Explain the operation of output control devices commonly used in PLC installations.
- 14 a. Explain in detail the switches commonly used in PLC installations.
OR
b. Describe in detail the various types of timer instructions.
- 15 a. Discuss the functions of PLC counter instructions.

p.t.o

OR

b. Write a detailed note on down counter with an example.

16 a. Illustrate in detail about the various math instructions

OR

b. Name and draw the symbol for five different types of data compare instructions.

17 a. Explain the purpose of the bit distribute instruction.

OR

b. Discuss the PID controller with merits and demerits

18 a. Illustrate various types of process control Applications with examples

OR

b. Describe briefly about the motor driven analog proportional control valve.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain in detail the Process memory organization in PLC.

OR

b. Explain in detail the various sensors and Transducers used in industries with example.

20 a. Write a program to control traffic lights in two direction

OR

b. Outline how a typical data acquisition and control system operates

SL.NO:1239

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

MATHEMATICS FOR MECHANICAL SCIENCES

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Obtain the partial differential equation by eliminating arbitrary constants a and b from $(x - a)^2 + (y - b)^2 + z^2 = 1$.
- 2 Form the partial differential equation by eliminating arbitrary function f from $z = f(x^2 + y^2)$.
- 3 What are Dirichlet's Conditions?
- 4 Find the value of a_n in the cosine series expansion of $f(x) = k$ in $(0,10)$.
- 5 What are the possible solutions of the one dimensional heat equation $u_t = \alpha^2 u_{xx}$.
- 6 In steady state conditions derive the solution of one dimensional heat flow equation.
- 7 If the probability that a target is destroyed on any one shot is 0.5, what is the probability that it would be destroyed on 6th attempt?
- 8 For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 15 hours. John owns one of these computers and wants to know the probability that the length of time will be between 50 and 70 hours.

9 State the equation of the two regression lines.

10 Give the limitations of method of least squares.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

11 a. Find the complete and singular solution of $z = px + qy + p^2 + q^2$

OR

b. Solve $z^2(p^2 + q^2 + 1) = 1$

12 a. Express $f(x) = (\pi - x)^2$ as a Fourier series of period 2π in the Interval $0 < x < 2\pi$

OR

b. Determine the Sine series for the function $f(x) = x$ in $(0, l)$

13 a. A string is stretched and fastened to two points at a distance ' l ' apart. Motion is started by displacing the string into the form $y = k \sin\left(\frac{\pi x}{l}\right)$ from which it is released at time $t = 0$. Calculate the displacement of the point of the string at a distance ' x ' from one end at time t .

OR

b. Determine the solution to the equation $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ that satisfies the conditions $u(0, t) = 0$, $u(l, t) = 0$ and $u(x, 0) = u_0$ for all x .

14 a. If 10% of the screws produced by an automatic machine are defective, Calculate the probability that out of 20 screws selected at random, there are

- (i) exactly 2 defective
- (ii) atmost 3 defective
- (iii) atleast 2 defective

OR

p.t.o

- b. Determine the mean and variance of geometric distribution.

15 a.

The ranking of ten students in Statistics and Mathematics are as follows. Determine the coefficient of rank correlation?

Statistics	3	5	8	4	7	10	2	1	6	9
Mathematics	6	4	9	8	1	2	3	10	5	7

OR

- b. Calculate Karl Pearson's coefficient of correlation

Price	10	11	13	15	18
Demand	60	52	48	40	30

16 a.

(i) Solve $p + q = \sin x + \sin y$

(ii) Solve $p + q = x + y$

OR

- b. Determine the Fourier series of period 2π , for the function $f(x) = x^2$ in $(-\pi, \pi)$.

17 a.

A square plate is bounded by the lines $x = 0$, $y = 0$, $x = 20$ and $y = 20$. Its faces are insulated. The temperature along the upper horizontal edge is given by $u(x, 20) = x(20-x)$, $0 < x < 20$ while the other three edges are kept at 0° c. Determine the steady state temperature distribution in the plate.

OR

- b. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Calculate the mean and variance of the distribution.

18 a.

Calculate the Mode for the following frequency distribution.

C.I	130-134	135-139	140-144	145-149	150-154	155-159	160-164
f	5	15	28	24	17	10	1

OR

p.t.o

- b. Determine the regression line of Y on X if

X	1	4	2	3	5
Y	3	1	2	5	4

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. (i) Solve $z = px + qy + \sqrt{pq}$

(ii) Solve $pyz + qzx = xy$

OR

- b. Calculate the Fourier series expansion of period 2π for the function $y = f(x)$ which is defined in $(0, 2\pi)$ by means of the table of value given below. Find the series up to the third harmonic.

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y	1.0	1.4	1.9	1.7	1.5	1.2	1.0

- 20 a. A rod 30 cm long has its ends A and B kept at 20°C and 80°C respectively until steady state conditions prevail. The temperature at each end is then suddenly reduced to 0°C and kept so. Calculate the resulting temperature $u(x, t)$ in the rod.

OR

- b. In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible. Variance of $X = 9$, Regression equations are $8X - 10Y + 66 = 0$, $40X - 18Y - 214 = 0$
Determine,

- the mean values of X and Y
- the correlation coefficient between X and Y
- the standard deviation of Y

SL.NO:1213

SUBJECT CODE:17MECC02

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
ENGINEERING THERMODYNAMICS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define an isolated system. Give examples.
- 2 Show the expressions for the COP of heat pump and refrigerator.
- 3 Define PMM of second kind.
- 4 Define Avogadro's law.
- 5 Differentiate macroscopic and microscopic characteristics of a system.
- 6 Differentiate between point function and path function with example.
- 7 Interpret assumption made in kinetic theory of gases
- 8 Interpret a triple point line in a p-v diagram for water.
- 9 Differentiate the vander waals equation from the ideal gas equation of state.
- 10 Interpret heating value of fuel.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Describe Van der Waals Equation for a real gas. Also derive the constants a and b.

OR

- b. 1 kg gaseous CO₂ contained in a closed system undergoes a reversible process at a constant pressure. During this process 42kJ of internal energy is decreased. Determine the work done during the process.

- 12 a. A certain gas of volume 0.4 m³, pressure of 4.5 bar and temperature of 130 °C is heated in a cylinder to 9 bar when the volume remains constant. Calculate (1) Temperature at the end of the process, (2) The heat transfer, (3) Change in internal energy (4) Work done by the gas (5) Change in enthalpy. Assume Cp = 1.005 kJ/kgK, Cv = 0.718 kJ/kg K

OR

(p.t.o)

- b. A cylinder contains 1 m^3 of gas at 100 kPa and 100 °C, the gas is polytropically compressed to a volume of 0.25 m^3 . The final pressure is 600 kPa. Determine a) Mass of the gas, b) The value of index "n" for compression, c) Change in internal energy of the gas and d) heat transferred by the gas during compression. (Take $R = 0.287 \text{ KJ / kg K}$, $\gamma=1.4$).
- 13 a. In a steady flow of air through a nozzle, the enthalpy decreases by 50 kJ between two sections. Assuming that there are no energy changes than the kinetic energy, determine the increases in velocity at section 2. If the initial velocity is 90 m/s.

OR

- b. 0.2 kg of air at 1.5 bar and 27°C is compressed to a pressure of 15 bar according to the law $PV^{1.25} = C$. Determine work done on or by air, heat flow to or from the air, increase or decrease in entropy.
- 14 a. A single stage air turbine is to operate with air inlet pressure and temperature of 1 bar and 600K. During the expansion the turbine losses are 20 kJ/kg to the surroundings which is at 1bar and 300K. For one kg of mass flow rate, determine (i) decrease in availability, (ii) maximum work, (iii) the irreversibility.

OR

- b. **A constant volume chamber of 0.3 m^3 capacity contains 1 Kg of air at 56°C . Heat is transferred to the air until temperature is 100°C . Calculate the work transfer, heat transfer and the change in internal energy, enthalpy and entropy.**
- 15 a. 1 kg of steam at a pressure of 700 kPa and 0.6 dry is heated at constant pressure until it becomes dry saturated. Determine change in internal energy and work done.

OR

- b. A nozzle is supplied with steam of 1 MPa at 200°C with a velocity of 100 m/s. The expansion takes place to a pressure of 300 kPa. Assuming isentropic efficiency of nozzle to be 90%, calculate the final velocity.

- 16 a. **A balloon of spherical shape 6m in diameter is filled with hydrogen gas at a pressure of 1 bar abs and 20°C . At a later time, the pressure of gas is 94% of its original pressure at the same temperature:**
(i) what mass of original gas must have escaped if the dimensions of the balloon is not changed, (ii) Calculate the amount of heat to be removed to cause the same drop in pressure at constant volume.

OR

- b. Calculate the specific volume of steam at 0.9 bar and 550K using Vander waals equation. Take critical temperature of steam is 647.3K and critical pressure is 220.9bar

- 17 a. The gas neon has a molecular weight of 20.183 and its critical temperature, pressure and volume are 46K, 2.5MPa and 0.05m³/Kg mol. Reading from a compressibility chart for a reduced pressure of 2 and a reduced temperature of 1.2, the compressibility factor Z is 0.75. Calculate the corresponding specific volume, pressure, temperature, and reduced volume?

OR

- b. Dry exhaust gas from an oil engine had the following composition by volume:
 CO₂ = 8.85%, CO = 1.2%, O₂ = 6.8% and N₂ = 83.15%.
 The fuel oil had a percentage composition by mass as
 C = 84%, H₂ = 14% and O₂ = 2%. Determine
 (i) mass of carbon per kg of dry flue gas. (ii) A:F ratio.

- 18 a. Describe the Characteristics and Properties of fuel.

OR

- b. Describe about the gaseous fuels and its advantages.

**Answer ALL questions
 PART-C (2 x 15 = 30)**

- 19 a. A turbine operates under steady flow conditions receiving steam at the following state: Pressure P = 1.2 Mpa, temperature T = 188 °C. Enthalpy h = 2785 kJ/kg, Velocity = 33.3 m/s and elevation = 3m. The steam leaves the turbine at the following state: Pressure P = 20 kPa, Enthalpy h = 2512 kJ/kg, Velocity = 100 m/s and elevation = 0 m. Heat is lost to the surrounding at the rate of 0.29 kJ/s. If the rate of steam flow through the turbine is 0.42 kg/s, Calculate the power output of the turbine in KW?

OR

- b. 1.6 Kg of air compressed according to the law $pV^{1.3} = C$ from a pressure of 1.2 bar and temperature of 20°C to a pressure of 17.5 bar. Calculate a) The final volume and temperature
 b) Work done c) Heat transferred d) Change in entropy

- 20 a. Prove that the difference in specific heat capacities equal to $C_p - C_v = R$ and $C_v = (TV\beta^2) / Kt$

OR

- b. Describe about the Internal energy and Enthalpy formation.

SL.NO:1208

SUBJECT CODE:17MECC16

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
INDUSTRIAL AUTOMATION

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List the disadvantages of Automation.
- 2 List the role of robotics in industrial automation.
- 3 What is a check valve?
- 4 What is meant by a 4/3 DC valve?
- 5 State the Programmable Logic Controller (PLC).
- 6 List the Advantages of PLC.
- 7 State the material transport system.
- 8 List the factors to be considered in the selection of transfer devices.
- 9 Draw the hydraulic symbol for the following.
(i) Fixed displacement bidirectional pump.
(ii) Variable displacement unidirectional pump.
- 10 Compare the method by which the process control operation is changed in a relay-based system to the method used for a PLC-based system.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Analysis the major factors that contribute to Overall Production Time.
OR
b. Examining none of automated system makes a significant application of Industrial IT?
- 12 a. Create the circuit diagram for the automatic cylinder reciprocation.
OR
b. Describe Economy of Scale in detail.
- 13 a. Explain the construction and working of internal gear pumps.
OR
b. Explain the spring loaded simple pressure relief valve with a neat sketch.
- 14 a. Explain any one of hydraulic pressure control valve.

p.t.o

2

OR

- b. Discuss the difference between NO and NC switches. Sketch both switches with corresponding pneumatic symbols.

- 15 a. Where the limit switches are used? Discuss its construction in detail with help of a simple diagram.

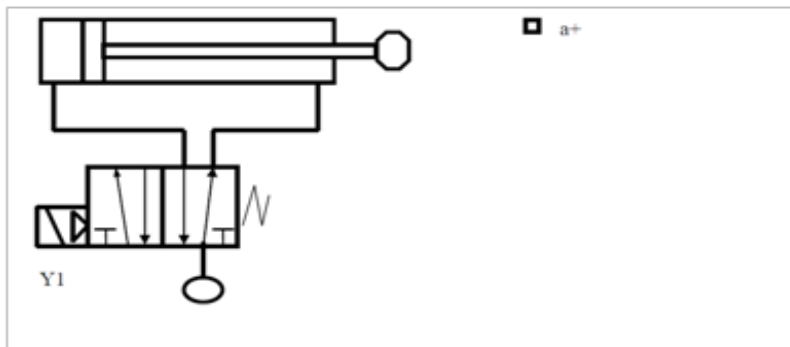
OR

- b. Explain the functions of ON delay timers with suitable circuit in detail.

- 16 a. Describe the similarities and differences between PLCs and PCs.

OR

- b.



Draw the PLC wiring diagram and the appropriate ladder logic, when a start push button is pressed, the pneumatic cylinder shown in Fig extends, remains extended for 5 seconds and then returns.

- 17 a. Describe the various electric and electronic control elements used in automation.

OR

- b. Discuss in detail transfer devices and feeders.

- 18 a. Differentiate between manual and automated assembly lines in detail.

OR

- b. Describe any one type of job rotating devices.

Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. Explain the construction and working of double acting cylinder with neat sketch.

OR

- b. Draw and explain hydraulic cylinder sequence circuit.

- 20 a. Discuss the direct and indirect control of electro-pneumatics for controlling double acting cylinder by using 5/2 DC valve with double solenoid.

OR

- b. Draw the ladder diagram and list the truth tables for the AND, OR, NOT, NAND, and NOR logic gates.

SL.NO:1185

SUBJECT CODE:17MECC18

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

MANUFACTURING ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Name the various sands that are normally encountered in foundry practice.
- 2 Mention the merits of runner and riser in a casting process.
- 3 Recall the principle of oxy-fuel gas cutting.
- 4 Tell the applications of welding process.
- 5 List out the unconventional machining process which uses mechanical energy.
- 6 What is meant by blending?
- 7 Mention the advantages of injection moulding process.
- 8 Define sintering.
- 9 For what kind of applications, punching operation is performed?
- 10 Explain the lancing process and state few applications.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Illustrate with neat sketch explain the CO₂ moulding.
OR
b. Identify the types of welding processes. Explain in detail.
- 12 a. Illustrate with a neat sketch explain the working of MIG welding.
OR
b. Make use of the applications, advantages of injection moulding.
- 13 a. Explain the different types of pattern material with its advantages and disadvantages.
OR
b. Explain the desired properties of moulding sand in detail.
- 14 a. Explain any two types of moulding processes with neat sketch.
OR
b. Show with a neat sketch of spot welding process in detail.
- 15 a. Discuss in detail thermit welding process with a neat sketch.

p.t.o

2

OR

b. Describe with neat sketch of crank and slotted quick return mechanism used in shaper.

16 a. Explain the working principle of grinding machine with a neat sketch.

OR

b. Discuss in detail about the working of Electric discharge machining with a neat sketch.

17 a. Illustrate with neat sketches explain extrusion process in detail.

OR

b. Explain transfer moulding process with neat sketches.

18 a. Explain the various types of cold rolling process with neat sketches.

OR

b. Describe explosive forming process with a neat sketch.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Construct the plasma arc welding process with its advantages, disadvantages and applications.

OR

b. Explain the different types of pattern with neat sketch.

20 a. Describe the injection moulding process in detail. Also mention its advantages and disadvantages.

OR

b. Show the metal spinning process in detail with its advantages, disadvantages.

SL.NO:1185

SL.NO:1186

SUBJECT CODE:17MEES01

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
MANUFACTURING ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is the main use of flux in melting metals and alloys?
- 2 When do you select sand casting process.
- 3 List the various flames obtain during gas welding.
- 4 How do you classify a lathe machine.
- 5 Define LASER.
- 6 Write down the principle of AJM.
- 7 What is a compounding material?
- 8 Define Extrusion.
- 9 What is the special forming process?
- 10 Compare between brazing and soldering.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Relate the advantages and disadvantages of plastics in detail.
OR
b. Illustrate with a neat sketch explain the working of TIG welding.
- 12 a. Illustrate with a neat sketch explain the working principle of ECG process.
OR
b. Illustrate with neat sketches explain thermoforming process in detail.
- 13 a. Identify the classification of unconventional machining processes.
OR
b. Explain the desired properties of moulding sand in detail.
- 14 a. Explain any two types of moulding processes with neat sketch.
OR
b. Explain with neat sketch the components of oxy-acetylene gas welding.
- 15 a. Describe about the soldering process with neat sketches.

p.t.o

2

OR

b. Describe with neat sketch of crank and slotted quick return mechanism used in shaper.

16 a. Compare between conventional and unconventional machining processes in detail.

OR

b. Discuss in detail about the working of Electric discharge machining with a neat sketch.

17 a. Demonstrate any three types of forging operation with neat sketch.

OR

b. Explain the various types of hot rolling process with neat sketches.

18 a. Discuss in detail about the Peen forming process with a neat sketch.

OR

b. Describe explosive forming process with a neat sketch.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Analyze the procedure of green sand moulding with neat sketches.

OR

b. Discuss in detail about Shell moulding process with neat sketches.

20 a. Explain with a neat sketch the construction and working of abrasive jet machining with its advantages, disadvantages and applications.

OR

b. Show the metal spinning process in detail with its advantages, disadvantages.

SL.NO:1186

SL.NO:1184

SUBJECT CODE:17MESE08

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-PRODUCT DESIGN AND DEVELOPMENT

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is meant by Product design?
- 2 Define Production Ramp-up.
- 3 Define product specification.
- 4 Define product planning.
- 5 What is meant by tree approach in concept generation?
- 6 What are the needs of industrial design?
- 7 What is meant by concept scoring?
- 8 Mention any two advantages in assessing quality of industrial design.
- 9 What is a geographical indication? Elucidate with an example.
- 10 What is copyright? What is the term of copyright for an author ?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Write a short note on product specification related to customer needs
OR
b. Write a short note on Patents.
- 12 a. State the influence of project selection & importance of allocation of resources. Explain it.
OR
b. Explain the phases of Product design and development.
- 13 a. Discuss about Concept testing and its importance.
OR
b. Explain the role of competitive bench marking in product planning.
- 14 a. Enumerate the steps involved in Establishing Target specification and discuss the relative importance of product needs.
OR
b. Discuss in detail about Product development Economics.

p.t.o

15 a. Explain the relative advantages and disadvantages of involving actual customers in the concept generation process.

OR

b. Illustrate the procedure for internal problem search and mention its limitations.

16 a. Explain the steps to measure customer response.

OR

b. List out the measurement technique involved in concept selection. Explain it.

17 a. What are the selection criteria needs to be fulfilled for the concept? Explain in detail.

OR

b. Write a short note on comparison of concepts in decision making. Explain its advantage and limitations.

18 a. Discuss in detail about the steps involved in Patent application filing process.

OR

b. What is meant by Design for Environment and discuss the legal compliance? Explain it.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Describe about Project planning and Project selection and mention its importance.

OR

b. Discuss in detail robust design of the product.

20 a. Discuss about i) Idea clarification ii) Exploring the output iii) Change management

OR

b. Explain in detail ISO system of Intellectual property rights.

SL.NO:1173

SUBJECT CODE:17MECC10

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ENGINEERING METROLOGY AND MEASUREMENTS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Summarize any four sources of error.
- 2 Summarize any four desirable characteristics of a sensor.
- 3 State the properties of thermoelectric materials.
- 4 List the classifications of resistance strain gauges.
- 5 State the most common using methods for measuring the pitch measurements.
- 6 Interpret any two angular measuring instruments used in metrology
- 7 Paraphrase the remedies to eliminate vibrations.
- 8 Write shortnotes on Linear Displacement Measurement.
- 9 What are the various methods used for measuring the gear tooth thickness?
- 10 What is meant by “Best size wire” in screw thread measurement?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. With neat sketch, the working principle of liquid filled thermometer.
OR
b. Summarize the working principle of Floating carriage micrometer with neat sketch.
- 12 a. Interpret the working principle of Vernier Bevel Protractor with neat sketch.
OR
b. Explain the working principle of micrometer with neat sketch.
- 13 a. Explain the working principle of Angle Decker with a neat sketch.
OR
b. Explain the various types of Mechanical tachometer.

P.T.O

2

14 a. Explain the working principle of D.C Tachogenerator.

OR

b. Discuss about the Non Contact type Displacement Transducer.

15 a. Discuss about the working principle of Thermistors.

OR

b. Illustrate with a sketch the working principle of rotometer.

16 a. With neat sketch explain the working principle of Thermo-electric pyrometer.

OR

b. Illustrate the working principle of Hydraulic load cell

17 a. With a neat sketch, the working of Torsion Bar dynamometer.

OR

b. Explain briefly proving rings.

18 a. Explain about the errors in Screw thread.

OR

b. Describe the Parkinson's Gear Tester with a neat sketch.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Briefly explain the modes of operation and applications of measurement system.

OR

b. With neat sketch explain the construction and working principle of LVDT. Write the advantages and Disadvantages of the LVDT.

20 a. Explain the various types strain gauge Measurements.

OR

b. Summarize the working principle of Tool makers microscope with a neat sketch.

SL.NO:1173

SL.NO:1170

SUBJECT CODE:17MBHS04

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
COMMON TO BTE,EEE,PHARMA , CSE & MECH
TOTAL QUALITY MANAGEMENT

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List down the any four advantages of fish-bone diagram.
- 2 Why is FMEA important?
- 3 Mention any four features of check sheet.
- 4 State the responsibilities of Management Representative for implementing quality systems.
- 5 List any four characteristics of a quality policy statement.
- 6 Define the term “parameter” in statistics.
- 7 Define the term maintenance.
- 8 Define the term “PDSA”.
- 9 Write short notes on product benchmarking.
- 10 Give a note on environmental policy.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain the roles and responsibility of quality council & senior management for implementing quality in an organisation.
OR
b. Outline the benefits and pitfalls of benchmarking.
- 12 a. Explain, in what way, the concept of ISO 14000 differs from ISO 9000 series of quality system.
OR
b. Discuss in detail about the dimensions of quality with your own example.
- 13 a. Enumerate the cost of quality and discuss its components in detail with respect to the service based industry.
OR
b. Discuss the important elements to achieve customer/supplier partnering relationship.

P.T.O

- 14 a. Write notes on:
 (a) Differentiate matrix diagram and matrix data analysis diagram.
 (b) Differentiate tree diagram and decision tree diagram.

OR

- b. The following table shows the number of point defects on the surface of a bus body on August 2019.

Body No.	No. of defects		Body No.	No. of defects
1	13		11	17
2	15		12	11
3	19		13	7
4	8		14	11
5	6		15	14
6	17		16	6
7	7		17	16
8	9		18	10
9	3		19	2
10	23		20	6

- a) Compute the value of \bar{C} and its control limits.
 b) Draw C – chart
 c) Compute value of \bar{C} and control limits for the future use, if you deem it necessary.

- 15 a. Describe the term quality statements with suitable illustrations for service organisation.

OR

- b. Is customer complaint necessary for an Organization? If yes, list the various tools used for collecting customer complaints.
- 16 a. Is quality management an issue only for management? Do you agree or not. Justify your answer.

OR

- b. Describe the Trilogy Cycle of Joseph Juran with neat diagram.
- 17 a. Define quality audit. enlighten the features and types of quality audit

OR

- b. What is meant by Operating Characteristics (OC) Curve? Explain it with the neat diagram.

P.T.O

SL.NO:1170

3

18 a. Summarize the advantages and limitations of benchmarking.

OR

b. What are the objectives of implementing TPM? Also describe in detail the concept of TPM.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Describe seven new tools of quality management with neat diagram of each.

OR

b. Elaborate the Japanese 5S concept as applicable to services and manufacturing company.

20 a. Write the step by step procedure for implementing FMEA of a product.

OR

b. Describe the various elements of ISO 9000 systems.

SL.NO:1170

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
HUMANITIES & SCIENCES

ENGINEERING MATHEMATICS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

1

Obtain the characteristic equation of $\begin{pmatrix} 2 & -3 & 1 \\ 3 & 1 & 3 \\ -5 & 2 & -4 \end{pmatrix}$

2

Define orthogonal matrices.

3

Define evolute.

4

Find the centre of curvature of the curve $y = x^2$ at the origin.

5

If $u = x^2y^3$ where $x = \log t$ and $y = e^t$ Find $\frac{du}{dt}$

6

Examine the maximum and minimum values of $3x^2 - y^2 + x^3$

7

Integrate $\int_0^1 \int_1^2 x(x+y) dy dx$.

8

Integrate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(\theta + \phi) d\theta d\phi$

9

Prove that $\nabla(r^n) = nr^{n-2} \vec{r}$

10

State Stoke's theorem

(p.t.o)

Answer Any FIVE questions
Part-B (5 x10 =50 Marks)

11 a.

Find the Eigen values and Eigenvectors of the matrix $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix}$.

OR

b.

Obtain the Eigen values and Eigenvector of the matrix $\begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$

12 a.

Obtain the equation to the circle of curvature of the curve $xy = c^2$ at (c, c) .

OR

b.

Prove that the radius of curvature at any point of the cycloid $x = a(\theta + \sin \theta); y = a(1 - \cos \theta)$ is $4a \cos \frac{\theta}{2}$

13 a.

Find the maximum and minimum values of the function $x^3 y^2 (1 - x - y)$

OR

b.

(i) If $u = \sin^{-1} \frac{x}{y} + \tan^{-1} \frac{x}{y}$, then find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$

(ii) Find $\frac{du}{dt}$ as a total derivative and verify the result by the direct substitution of $u = x^2 + y^2 + z^2$ when $x = e^{2t}, y = e^{2t} \cos 3t$, and $z = e^{2t} \sin 3t$

14 a.

Integrate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \int_0^{\sqrt{a^2-x^2-y^2}} \frac{dz dy dx}{\sqrt{a^2-x^2-y^2-z^2}}$

OR

(p.t.o)

Sl.No.17MABS01

- b. Obtain the area enclosed by the parabola $y^2 = 4ax$, x -axis and the latus rectum of the parabola.

15 a.

If $\vec{F} = x^2\vec{i} + xy\vec{j}$ evaluate $\int \vec{F} \cdot d\vec{r}$ from $(0, 0)$ to $(1, 1)$ along the line $y=x$

OR

b.

Obtain the values of a and b so that the surfaces $ax^3 - by^2z = (a+3)x^2$ and $4x^2y - z^3 = 11$ may cut orthogonally at $(2, -1, -3)$

16 a.

Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the planes $y + z = 4$ and $z = 0$.

OR

b.

For the given curve $x = a \cos \theta, y = b \sin \theta$ Find ρ at $\left(\frac{a}{\sqrt{2}}, \frac{b}{\sqrt{2}}\right)$

17 a.

Obtain the equation to the circle of curvature of the curve $xy = c^2$ at (c, c) .

OR

b.

Prove that the radius of curvature at any point of the cycloid

$$x = a(\theta + \sin \theta); y = a(1 - \cos \theta) \text{ is } 4a \cos \frac{\theta}{2}$$

18 a.

Prove that $\nabla^2 (r^n) = n(n+1)r^{n-2}$ where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ and $r = |\vec{r}|$

OR

(p.t.o)

Sl.No.17MABS01

- b. For the curve $x^3 + y^3 = 2$ find the co-ordinates of the centre of curvature at the point (1, 1)

Answer ALL questions
PART-C (2 x 15 = 30)

19 a.

Diagonalise the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ and hence find A^5

OR

- b. Obtain the equation of the evolute of the curve $x^{2/3} + y^{2/3} = a^{2/3}$

20 a.

Determine the value of $\int_0^1 \int_0^{\sqrt{x^2}} (x^2 + y^2) dy dx$

OR

- b. Change the order of integration in $\int_0^a \int_y^a \frac{x^2}{\sqrt{x^2 + y^2}} dx dy$ and then evaluate it.

SL.NO:1165

SL.NO:1161

SUBJECT CODE:17MECC34

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

HYDRAULIC AND PNEUMATIC SYSTEMS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Why gear pump cannot be used as variable displacement pump?
- 2 Show the hydraulic symbols for telescoping cylinder.
- 3 What is a check valve?
- 4 What is the function of “bleed off” circuits?
- 5 Name three different types of separator-type accumulators
- 6 What is the purpose of I/O module in a PLC.
- 7 Define bulk modulus.
- 8 Draw the hydraulic symbol for the following.
(i) Unloading valve
(ii) Counter balancing valve
- 9 What is cylinder cushion? What is its purpose?
- 10 Mention any two roles of pneumatic systems in low cost automation.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Show where the hydraulics highly preferred.
OR
b. Show where the pneumatics are preferred.
- 12 a. List any ten applications of pneumatics and detail any two of them.
OR
b. Discuss the low cost automation.
- 13 a. What are the basic laws that are important in applying fluid power and what its significance?
OR
b. Describe the various pneumatic symbols.
- 14 a. Explain the construction and working of gerotor pump.
OR
b. With the help of neat sketch explain the working of air regulator

p.t.o

2

15 a. Explain compound relief valve with a neat sketch.

OR

b. Draw a schematic of 3/2 DCV that is manually operated and briefly explain its function

16 a. Explain the operation of tandem-type cylinder and mention its applications

OR

b. With the help of a neat sketch, explain the pump-unloading circuit

17 a. Explain the working principle of fail safe circuit with overload protection

OR

b. Draw and explain hydraulic cylinder sequence circuit

18 a. Explain the ladder logic diagram with example?

OR

b. Draw a neat sketch of a pneumo-hydraulic for sequencing drilling and clamping cylinders

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Discuss about the various Hydraulic fluids.

OR

b. Discuss about the properties of fluids.

20 a. With the help of neat sketch explain the working of air filter.

OR

b. Draw and explain the hydraulic circuit for the following sequence.

a. Clamping the work piece b. Drilling the work piece c. Unclamping the work piece

SL.NO:1161

SL.NO:1162

SUBJECT CODE:17MECC01

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

BASIC MANUFACTURING PROCESS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 State the differences between green sand mold and dry sand mold.
- 2 How is pressure die casting different from gravity die casting?
- 3 What is filler material?
- 4 Why is the tungsten inert-gas welding preferred for welding aluminum plates?
- 5 What are the different ways by which defects occur in forging?
- 6 List out the various tools used in sheet metal operation.
- 7 What is meant by trimming?
- 8 Name any five tools used in sheet metal hand operations.
- 9 List out the types of moulding of plastics.
- 10 Define Polymerization.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Describe the different types of electrodes and it applications.
OR
b. What are the different welding defects? How the defects are eliminated?
- 12 a. Write short notes on (a). Two High Roll Mill (b). Three High Roll Mill.
OR
b. In detail describe the choice of materials available for making patterns.
- 13 a. Explain the CO₂ moulding process. State its advantages and application.
OR
b. Describe the working principle of Oxy-acetylene gas welding process with help of neat sketch.
- 14 a. With necessary sketches explain submerged arc welding.
OR
b. Describe the process of seam welding and list the applications.

p.t.o

15 a. Explain the operational steps of Rolling of square sections, rounds, plate, sheet and strip from a stock. Draw sketches wherever necessary.

OR

b. Explain the method of making seamless tubes.

16 a. Illustrate with sketch explain a wire drawing process.

OR

b. What is embossing? Explain the process of embossing. Mention its applications.

17 a. Briefly explain various types of bending operations with a neat sketch.

OR

b. Explain the working principle of injection moulding.

18 a. Explain the working principle of transfer moulding with neat sketch.

OR

b. Explain with a neat sketch the working of ultrasonic welding of plastics.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain with neat sketches steps involved in Sand casting process.

OR

b. Explain the process of Metal Inert Gas (MIG) welding with necessary sketches. List the base metals commonly welded by MIG welding.

20 a. Explain the method of manufacturing of different components of chains used in transmission system.

OR

b. Describe the lamination process with a neat sketch.

SL.NO:1152

SUBJECT CODE:17MEEC23

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-RAPID PROTOTYPING AND TOOLING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Give in own about STL file?
- 2 Discuss about the functions of part support structure.
- 3 Discuss photo polymerization in Stereo lithography.
- 4 List out applications of Stereo lithography process.
- 5 What are the benefits of Three Dimensional Printing
- 6 Examine weaknesses of Laser Engineered Net Shaping (LENS)
- 7 Write a short note on direct rapid tooling process.
- 8 Examine the benefits of aluminum filled epoxy tooling.
- 9 Define Point Processing.
- 10 Define contact type and non-contact type.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain in detail the process chain of Rapid Prototyping.
OR
b. Describe the impact of on rapid prototyping product development.
- 12 a. Explain the various demands on CAD system used in rapid prototyping
OR
b. Describe with a neat sketch of Solid Ground Curing process.
- 13 a. Explain in detail the Fused Deposition Modeling
OR
b. Examine the strength, Weakness and applications of Solid Ground Curing?
- 14 a. Examine the strength, Weakness and applications of Multi Jet Modeling System.
OR
b. What are the applications of direct shell production casting and explain its working principle.

p.t.o

15 a. Use with neat sketch explain the working principle of Direct Metal Deposition

OR

b. Discuss the advantages and disadvantages of selective laser sintering.

16 a. Explain in detail about Shape Deposition Manufacturing.

OR

b. Explain in detail the working principle of Reaction Injection Moulding

17 a. Illustrate the need and application rapid tooling.

OR

b. Discuss about Digitizing techniques for Reverse Engineering.

18 a. Discuss on STL files and define slicing relevant to CAD.

OR

b. Describe how reverse engineering will be applied to rapid prototyping techniques

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the benefits and applications of rapid prototyping in different sectors.

OR

b. Illustrate with neat sketch and explain the operation principle and its applications of Solid Ground Curing.

20 a. Describe the following on indirect tooling techniques (i) Epoxy Tooling (ii) Powder Metal Forging

OR

b. Write short on following. (i) Influence of building orientation. (ii) File exchange errors.
(iii) Errors in STL files. (iv) Part building errors.

SL.NO:1141

SUBJECT CODE:17MECC13

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

DESIGN OF TRANSMISSION SYSTEMS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Name the four types of belts used for transmission of power.
- 2 When do we use worm-gears
- 3 Define progression ratio.
- 4 When does a brake become self-locking?
- 5 List the examples for radial and axial brakes.
- 6 Distinguish between short link and long link chains.
- 7 Summarize the Lewis equation for beam strength.
- 8 Write the expression for beam strength, dynamic load, and limiting wear load for bevel gears
- 9 Classify the four types of gear box.
- 10 Define R20 series

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. A flat belt is required to transmit 35 kW from a pulley of 1.5m effective diameter running at 300 r.p.m. The angle of lap is 165° and $\mu = 0.3$. Determine the width of the belt taking centrifugal tension into account. Belt thickness is 9.5 mm, density of material is 1.1Mg/m^3 and the related permissible working stress is 2.5MPa

OR

- b. A pinion with 25 teeth and rotating at 1200rpm drives a gear which rotates at 200rpm and module is 4mm.calculate the center distance between the gears.

P.T.O

- 12 a. A parallel helical gear set consists of a 19-teeth pinion driving a 57-teeth gear. The pinion has a left-hand helix angle of 20° , a normal pressure angle of $14\frac{1}{2}^\circ$, and a normal diametral pitch of 0.4 teeth/mm. Find:
- [a] The normal, transverse, and axial circular pitches.
 - [b] The transverse module and the transverse pressure angle.
 - [c] The pitch diameter of the two gears

OR

- b. A helical gear with 30 degree helix angle has to transmit 35kW at 1500 rpm with a speed reduction ratio 2.5. If the pinion has 24 teeth determine the necessary module, pitch diameter and face width for 20 degree full depth teeth. Assume 15Ni2Cr1Mo15 material for both pinion and wheel.
- 13 a. Design a cast iron bevel gear drive for a pillar drilling machine to transmit 1875W at 800 r.p.m. to a spindle at 400 r.p.m. The gear is to work for 40 hours/week for 3 years. Pressure angle is 20° .

OR

- b. A hardened steel worm rotates at 1440 rpm and transmits 12 KW to a phosphor bronze gear. The speed of the worm wheel should be $60 \pm 3\%$ rpm. Design the worm gear drive if an efficiency of at least 82% is desired.
- 14 a. Design a worm gear drive to transmit 10 KW at 1440 rpm with a gear ratio of 12. Use steel worm and cast iron wheel.

OR

- b. The minimum and maximum speed of a six speed gear box are to be 160 and 500 rpm. Construct the kinematic arrangement and the ray diagram of the gear box.
- 15 a. A gear box is to be designed to provide 12 output speeds ranging from 160 to 2000 rpm. The input speed of motor is 1600 rpm. Choosing a standard speed ratio, construct the speed diagram and the kinematic arrangement.

OR

- b. A machine tool gear box is to have 12 speeds. With the output speeds ranging from 63 to 2800 r.p.m. Construct the speed diagram and the kinematic layout for 2(1) 2(2) 3(4) scheme.
- 16 a. A single plate Clutch transmits 25 KW at 900 r.p.m. The maximum pressure intensity between the plate is 85 KN/m^2 . The ratio of radii is 1.25. Both the sides of the plate are effective and the coefficient of friction is 0.25. Determine (i) the inner diameter of the plate, and (ii) the axial force to engage the clutch. Assume theory of uniform wear.

OR

- b. A single block brake, the diameter of drum is 250 mm and the angle of contact is 90° , the operating force of 700 N is applied at the end of lever which is at 250 mm from the center of the brake block. Determine the torque that may be transmitted. Fulcrum is at 200 mm from the center of brake block with an offset of 50 mm from the surface of contact. The coefficient of friction is 0.35.

P.T.O

SL.NO:1141

- 17 a. Explain the different types of flat belt drive and their application.

OR

- b. Explain the design procedure of Wire Rope.

- 18 a. Illustrate with a neat sketch, explain the working of a single plate clutch.

OR

- b. Derive an expression for the torque to be transmitted by clutch assuming (i) Uniform pressure condition (ii) Uniform wear condition.

Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. Design a spur gear drive required to transmit 45 KW at a pinion speed of 800 r.p.m. The velocity ratio is 3.5:1. The teeth are 20 ° full depths involute with 18 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe static stress of 180 N/mm². Assume medium shock conditions.

OR

- b. Design a bevel gear drive to transmit 12 KW at 1400 rpm for the following data: Gear ratio=3; Material for pinion is steel; Material for wheel is cast iron; and life 10,000 hours.

- 20 a. Design a 9 speed gear box to give output speeds between 280 and 1800 rpm. The input power is 5.5 KW at 1400 rpm. Draw the kinematic layout diagram and the speed diagram. Determine the number of teeth on all gears and the length of all the shafts.

OR

- b. A car engine has its rated output of 12 KW. The maximum torque developed is 100 N-m. The clutch used is of single plate type having two active surfaces. The axial pressure is not to exceed 85 KN/m². The external diameter of the friction plate is 1.25 times the internal diameter. Determine the dimensions of the friction plate and the axial force exerted by the springs. Coefficient of friction = 0.3.

SL.NO:1141

SL.NO:1131

SUBJECT CODE:17MESE41

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-MAINTENANCE MANAGEMENT

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define Failure Density.
- 2 Define availability.
- 3 List out some condition based monitoring techniques.
- 4 Recall about equipment health monitoring.
- 5 Recall running in Failures.
- 6 Give an example of an overstress failure mechanism.
- 7 Recall the various steps in autonomous maintenance.
- 8 Define how does remote maintenance differ from e-maintenance.
- 9 Explain why is it necessary to replace a machine.
- 10 Express the relationship between reliability and safety.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Analyse various techniques of spare parts management.
OR
b. Discuss different types of maintenance strategies.
- 12 a. Explain the importance of understanding failure mechanisms for sound maintenance practice.
OR
b. Illustrate a comprehensive design for maintainability of various machines and equipment.
- 13 a. Illustrate non-repairable item, What types of Preventive Maintenance policies are appropriate for this type of item?
OR
b. Explain the functions of maintenance.
- 14 a. Explain fixed time maintenance.
OR
b. Discuss the advantages and disadvantages of breakdown maintenance.

2

15 a. Explain how availability can be improved through reliability and maintainability.

OR

b. Discuss spare parts management.

16 a. Explain in detail about maintenance outsourcing.

OR

b. Write a brief notes on Maintenance Capacity Planning.

17 a. Describe, using a flow chart, the steps involved in FMEA.

OR

b. Describe about maintenance logistics, Explain the main elements of maintenance logistics.

18 a. Write short notes on 1. Planned Maintenance 2. Quality Maintenance

OR

b. Explain reliability centered maintenance and total productive maintenance in detail.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the effect of material on failure mechanisms.

OR

b. Determine the different types of organizations are in use in Indian industries.

20 a. Explain briefly the process involved in condition monitoring.

OR

b. Explain the general structure of computerized maintenance management system.

SL.NO:1130

SUBJECT CODE:17MESE34

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-FAILURE ANALYSIS OF MATERIALS

Time : Three Hours

Maximum Marks:100 Marks

Answer ALL questions
Part-A (10 x 2 =20 Marks)

- 1 List any two hardness tests
- 2 How metal surface appears when it fails in a brittle manner ?
- 3 Creep is a ----- temperature phenomenon
- 4 Creep rate in tertiary stage is associated with _____ and fracture
- 5 Cold working----- fatigue strength
- 6 Which of the following law is applicable for the fracture event -----law of thermodynamics

- 7 List the relationship between surface energy and crack propagation
- 8 Compare Mode I and Mode III
- 9 Compare K- IC and K- II C
- 10 Grain boundary sliding occurs, When the ----- of the grain is more than that of grain boundary

Answer Any FIVE questions
Part-B (5 x10 =50 Marks)

- 11 a. Illustrate various modes of loading with neat diagrams
OR
b. Compare SN curves of aluminium and steel with examples

- 12 a. Compare Toughness and fracture toughness
OR
b. Compare fatigue behaviour of stainless steel and cast iron

- 13 a. Compare creep test and fatigue test with example
OR
b. Explain various metallographic aspects of fracture

- 14 a. Explain strain energy release rate with examples
OR
b. Explain Paul - Paris law with examples

p.t.o

2

15 a. Explain various factors which affect the ductile to brittle transition

OR

b. Explain slip band crack growth

16 a. Explain wood mechanism of fatigue with examples

OR

b. Explain micro and macro features of ductile fracture

17 a. Explain Izod Impact test in detail with example

OR

b. Explain why, fractured ceramic specimens are coated with gold before fractography

18 a. Compare optical microscopy and scanning electron microscopy used for failure analysis

OR

b. Explain, creep behaviour plays role in the selection of materials

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Compare creep resistant alloys with thoria dispersed nickel

OR

b. Explain fractography in detail

20 a. Explain in detail about the fractography with example

OR

b. Explain design procedures which will improve fatigue crack growth resistance

SL.NO:1130

SL.NO:1129

SUBJECT CODE:17MESE29

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-REFRIGERATION AND AIR-CONDITIONING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What are the various types of refrigerators?
- 2 Define wet compression in vapour compression refrigeration and show it on a chart
- 3 Define entrainment nozzle efficiency in steam jet refrigeration system?
- 4 Explain the process of heating and humidification.
- 5 Write the meaning of fresh air handling unit (FAHU)?
- 6 Define room sensible heat factor (RSHF).
- 7 What are the desirable requirements of a Refrigerant - Absorption pair?
- 8 Which parts replace the function of compressor in absorption system?
- 9 Explain the concept of greenhouse effect.
- 10 State the classification of condenser used in refrigeration system?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain working principle of evaporative condenser with neat sketch.
OR
b. Define by pass factor and the function of airwasher and its types.
- 12 a. Describe with a neat sketch the working of lithium Bromide (two shell) water absorption system.
OR
b. Explain the vapour compression cycles system with the help of P-h diagram.
- 13 a. Explain how you would detect whether a refrigerant is under charged or over charged.
OR
b. Explain the various desirable properties of ideal refrigerants.
- 14 a. Describe the working principle and basic components steam jet refrigeration system.
OR
b. List out the various psychrometric properties of air and explain each.

p.t.o

15 a. What is meant by sensible heating and sensible cooling? Explain these processes with neat sketches.

OR

b. Describe about comfort airconditioning and its requirements.

16 a. Explain the thermal exchange mechanism of human body with environment?

OR

b. Explain winter air conditioning system with sketch and also represent the conditions on P-H chart.

17 a. With a neat sketch explain the working principle of Li Br-water absorption refrigeration system.

OR

b. Explain with neat sketch Domestic Electrolux Refrigerator, with the functions of hydrogen, ammonia and water in the three fluid refrigeration system.

18 a. Mention the chemical formula and the refrigerant number of following refrigerants: (i) Dichloro difluoro methane, (ii) Dichloro tetrafluoro ethane, (iii) propylene, (iv) ethylene and (v) sulphur dioxide

OR

b. In a steam jet refrigeration plant, steam enters the thermocompressor at 0.01 bar and with dryness fraction of 0.09, make up water enters the flash chamber at 180C. Determine i) Quality of steam leaving the flash chamber. ii) COP of the plant based on heat input from motive steam. Assume isentropic efficiency η of turbine =90%: Nozzle efficiency=90%: Entrainment efficiency =65%: Thermocompressure efficiency= 65%

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. The design conditions for an air conditioned hall is Inside condition 24°C DBT and 60% RH Outside condition 38°C DBT and 28°C WBT Sensible heat gain 167040 kJ/hr Latent heat gain 41760kJ/hr Infiltrated air 20CMM Coil ADP 10°C 60% of total air is recirculated and mixed with conditioned air after cooling coil. Determine i) The condition of air before entering the hall ii) The condition of air leaving the conditioner coil iii) BPF of cooling coil iv) refrigeration load on cooling coil.

OR

b. Describe the phenomena of global warming potential and ozone depleting potential, state the values for typical refrigerants.

20 a. Explain the principle of various dehumidification methods.

OR

b. Describe the working of steam jet refrigeration system with a neat sketch.

SL.NO:1128

SUBJECT CODE:17MESE23

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-MICRO AND NANO MACHINING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is the need for micro machining?
- 2 What are all the problems occurred during micro machining?
- 3 What is micro turning?
- 4 Mention the types of back rake angle.
- 5 List the applications of EDM.
- 6 List the advantages of Magnetorheological Abrasive Flow Finishing.
- 7 What is MEMS?
- 8 Mention different dry etching techniques.
- 9 Give the examples for thermal energy methods.
- 10 Mention some features of 3-D packaging in MEMS.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain the challenges to manufacturing technology for adopting nano machining methods.
OR
b. Explain all the fabrication tools used in micro machining.
- 12 a. Explain the commercial tool materials used in nano machining.
OR
b. Explain the advantages and disadvantages of nano machining.
- 13 a. Explain the orthogonal cutting and oblique cutting with its neat sketches.
OR
b. Explain the construction and working of micro drilling with neat sketch.
- 14 a. Explain the construction and working of precision grinding with neat sketch
OR
b. Explain the construction and working principle of USM.
- 15 a. Explain with neat diagram the construction and working principle of EBM.

p.t.o

2

OR

b. Explain with neat diagram the working principle of IBM.

16 a. Discuss the advantages, disadvantages and application of AFF.

OR

b. Compare Magnetorheological Finishing and Magnetorheological Abrasive Flow Finishing.

17 a. Compare EEM and Magnetic Float Polishing.

OR

b. Briefly discuss about deep reactive ion etching (DRIE) process.

18 a. Give short notes on diffusion process used in MEMS industry.

OR

b. Deduce the limitations in micromachining in MEMS.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Describe any two commercial cutting fluids used in micromachining with its advantage and disadvantage in detail.

OR

b. Explain the construction and working of micro drilling with advantage, disadvantage and application.

20 a. Briefly explain the types of abrasive based micro machining.

OR

b. Explain with neat diagram the construction and working principle of Magnetorheological Abrasive Flow Finishing process.

SL.NO:1128

SL.NO:1127

SUBJECT CODE:17MESE14

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-REVERSE ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer ALL questions
Part-A (10 x 2 =20 Marks)

- 1 Write a brief note on meshing.
- 2 What are the different types of meshing?
- 3 Write a short note on 3D scanning.
- 4 Illustrate structured lighting system with an example.
- 5 What is meant by Re-Engineering in Automotive sector?
- 6 What is meant by Copyright infringement?
- 7 Write a short note on Geometric modelling.
- 8 Define Forward Engineering.
- 9 What is meant by Stereoscopic Imaging system?
- 10 Write a short note on radical re-design.

Answer Any FIVE questions
Part-B (5 x10 =50 Marks)

- 11 a. Discuss the role of value analysis in Reverse Engineering.
OR
b. Briefly explain the "X-Ray Tomography in Re-Engineering system.
- 12 a. Briefly explain about contour model.
OR
b. Describe the techniques for converting a point cloud data to a 3D surface.
- 13 a. Distinguish between Forward Engineering and Reverse Engineering.
OR
b. Briefly discuss the merits and demerits of Re-Engineering in Medical Industry.
- 14 a. How will you define reverse engineering as a quality function?
OR
b. Describe the steps involved in Cloud point Generation.
- 15 a. Briefly explain the design Parameters of reverse engineering tool.

p.t.o

OR

b. What are the legal issues encountered in RE process? Explain in detail.

16 a. Briefly explain the Edge Detection techniques in Reverse Engineering.

OR

b. Briefly explain the risk involved in failure of Reverse Engineering.

17 a. With a block diagram, discuss the steps involved in Conceptualization to Integration with Rapid prototyping.

OR

b.

With a block diagram, Explain the process of Integration of an Additive Manufacturing Machine.

18 a. Explain on Process planning strategy in Re-Engineering.

OR

b. Discuss the patent law related to Re-Engineering.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the process of Internal measurement and discuss the steps involved.

OR

b. Discuss the Engineering Ethics to be followed in Developing a Re-Engineering Product.

20 a. List and explain in detail the various tools for reverse engineering.

OR

b. Explain in detail pre-screening and preparation for the four stage process of RE.

SL.NO:1127

SL.NO:1126

SUBJECT CODE:17MESE02

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-ENERGY CONSERVATION AND MANAGEMENT

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is meant by energy policy?
- 2 What is the main objective of energy management for electrical loads?
- 3 How do you mean by di-electric heating.
- 4 List the green energy .
- 5 Discuss the few important technical feasibility parameters that one should consider during analysis of energy conservation opportunities.
- 6 Summarize the features of the energy accounting software.
- 7 Discuss the need for energy conservation.
- 8 List any four important factors involved in deciding final cost of purchased electricity.
- 9 Discuss the need for managerial skills in energy management.
- 10 Explain,how do you understand by plant energy performance (PEP).

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain the various inductions heating type melting process.
OR
b. State and explain the factors that influence thermal performance of the buildings.
- 12 a. Give a typical energy audit reporting format
OR
b. Define energy management. State the basic principles and benefits of energy management.
- 13 a. Explain in detail about classification of waste heat recovery systems.
OR
b. State the different energy saving tips in fan & compressors.
- 14 a. With a neat sketch explain Gas turbine co-generation plant.
OR
b. Explain the various steps in designing an energy management program

p.t.o

2

15 a. Explain the four general categories of energy saving.

OR

b. Explain about surveying energy uses and losses.

16 a. Explain the various aspects of Cool storage systems.

OR

b. With a numerical example explain Load cycling of motors.

17 a. Discuss in detail the major objectives and fundamental principles in green building concept.

OR

b. Explain in detail about Energy storage in batteries

18 a. Explain in detail about Electrical energy management in residential buildings.

OR

b. Discuss the sources of waste heat and its potential application.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Discuss the various aspects of space heating.

OR

b. Discuss about energy audit report writing as per prescribe format in detail.

20 a. Explain Immediate-term, Medium-term and long –term strategies used for energy.

OR

b. Explain a) Plant energy performance b) Production factor c) Reference year equivalent energy use.

SL.NO:1126

SL.NO:1119

SUBJECT CODE:17PHBS05

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
COMMON TO ALL
SMART MATERIALS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Demonstrate, how the Metallic glasses can be used for transformer core materials?
- 2 Explain briefly about transformation temperature in SMA.
- 3 Distinguish between Type I and Type II Superconductors.
- 4 Interpret unit cell.
- 5 Demonstrate top-down and bottom-up approach for producing nanoparticles.
- 6 Interpret any two techniques for the synthesis of nanophase materials.
- 7 Explain briefly about top-down approach.
- 8 Describe coercivity and retentivity.
- 9 Explain briefly about soft magnetic materials.
- 10 Identify the reason, why the superconductor exhibits the property of diamagnetism?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Categorize metallic glasses? Give examples. Mention the properties of metallic glasses.

OR

 - b. Draw the unit cells of SC, BCC, FCC and HCP structures
- 12 a. Examine the effects of temperature, magnetic field and current on the superconductivity.

OR

 - b. Schedule the following for SC, BCC, FCC and HCP structures
- 13 a. Explain the properties of diamagnetic materials with neat diagram.

OR

 - b. Explain two characteristics of SMA with neat diagrams.
- 14 a. Explain the properties of Ni-Ti alloy.

p.t.o

OR

- b. Express the outline of magnetic and electrical properties of metallic glasses. Mention any two applications of metallic glasses.

- 15 a. Describe the following (i) unit cell (ii) coordination number (iii) nearest neighbour distance (iv) packing factor

OR

- b. Explain the advantages, disadvantages and applications of ball milling method.

- 16 a. Explain Carbon Nano Tubes? How are they classified? Explain.

OR

- b. Explain in detail about any one of the methods of fabrication of CNT.

- 17 a. Differentiate the properties of dia, para and ferromagnetic materials

OR

- b. Discuss the properties of superconductors.

- 18 a. Describe about Type – I super conductor. Write down its characteristics.

OR

- b. Discuss Isotope Effect and Meissner effect.

Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. Categorize hard and soft magnetic materials? Mention their applications.

OR

- b. Generalize the properties of metallic glasses.

- 20 a. Illustrate sol-gel method of preparing nanophase materials and mention its advantages.

OR

- b. Illustrate hysteresis on the basis of domain theory.

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E.DEGREE EXAMINATIONS- FEB - 2022
COMMON TO ALL
PHYSICAL SCIENCES

(Candidates admitted under 2017 Regulations-SCBCS)

Time : 1 1/2 Hours

Maximum Marks:50 Marks

PART A - ENGINEERING PHYSICS

Answer **ALL** questions

Part-A (5 x 2 =10 Marks)

- 1 Tell about population inversion.
- 2 Schedule any two applications of laser in industrial field.
- 3 Report about step index fiber.
- 4 Tell about the characteristics of graded index multimode fiber.
- 5 Interpret about X-ray Fluoroscopy.

Answer **Any FIVE** questions

Part-B (2 x12 =24 Marks)

- 6 a. Predict the applications of laser in communication, military and chemical fields.
OR
- b. Recognize the following terms: population inversion, pumping process and laser action.
- 7 a. Express the various types of fibers based on refractive index profile.
OR
- b. Express the characteristics of penetrant.

Answer **ALL** questions

PART-C (1 x 16 = 16)

- 8 a. Demonstrate the construction and working of semiconductor laser with necessary diagram.
OR
- b. Illustrate the working of X-ray radiography.

PART A - ENGINEERING CHEMISTRY
(Candidates admitted under 2017 Regulations-SCBCS)

Time : 1 1/2 Hours

Maximum Marks:50 Marks

Answer **ALL** questions
Part-A (5 x 2 =10 Marks)

- 1 Brief the terms electrolytic and electrochemical cell.
- 2 What is helmholtz's electrical double layer?
- 3 Show the structure of EDTA and Ca-EDTA complex.
- 4 Mention the causes of boiler corrosion
- 5 Write a note on solar energy

Answer **Any FIVE** questions
Part-B (2 x12 =24 Marks)

- 6 a. Explain standard electrode potential in detail.

OR
- b. Calculate the emf of the cell $\text{Mg}/\text{Mg}^{2+} // \text{Cd}^{2+} (\text{aq}) / \text{Cd}(\text{s})$ at 25°C where, $[\text{Cd}^{2+}] = 0.7\text{M}$, $[\text{Mg}^{2+}] = 1.0\text{M}$ and $E^{\circ}_{\text{cell}} = 1.97 \text{ V}$.
- 7 a. Discuss in detail dry corrosion with mechanism.

OR
- b. Describe producer gas in detail.

Answer **ALL** questions
PART-C (1 x 16 = 16)

- 8 a. Explain the working principle of $\text{H}_2\text{-O}_2$ fuel cell with reactions.

OR
- b. Elaborate the non-conventional energy sources.

S.No.1118

SL.NO:1111

SUBJECT CODE:17MESE46

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
ELECTIVE - WORK DESIGN AND ERGONOMICS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define product.
- 2 Define standard time.
- 3 Mention some work measurement equipment.
- 4 What is meant by Special allowance time?
- 5 State the principles of salary.
- 6 Why is a human factor important?
- 7 What is the role of the human factors coordinator (HFC)?
- 8 How will measure the Somatotypes?
- 9 How is anthropometry used today?
- 10 What is the use of stadiometer?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. What are the various symbols of process chart? Explain in detail.
OR
b. Explain the steps involved in conducting the method study.
- 12 a. Explain with suitable example the significance, construction and applications of the multiple activity charts.
OR
b. What is the difference between micro and macro motion charts? Explain it.
- 13 a. List out the various steps in conducting a stop watch time study. Explain in detail.
OR
b. Explain the systematic procedure of time study.
- 14 a. What do you understand by PMTS? Explain its importance in time study.
OR
b. Discuss in detail about Taylor's Differential Piece Rate Plan

(p.t.o)

2

15 a. Describe in detail about Merrick's Multiple Piece Rate Plan

OR

b. Discuss in detail about the following:

1. MTM 2.MOST

16 a. How can human factors contribute in ergonomics? Explain in detail.

OR

b. Explain the various stages of human system design and development in detail.

17 a. Discuss the process of muscle metabolism in human beings during work.

OR

b. Discuss in detail about the anthropometric division of body types.

18 a. Discuss in detail about static anthropometry with neat sketch.

OR

b. Illustrate with a neat sketch, explain in detail about Sitting postures anthropometry.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Solve – A job has been sub-divided into 4 elements. The time for each element and t_i respective rating are given below :

Element Number	Observed Time	Rating Factor %
1	0.6	100
2	1.0	80
3	1.2	130
4	1.5	90

Calculate the normal time and standard time for each element and for the job if the allowance is 5%.

OR

b. Describe in detail about Output-based incentive plans.

20 a. Discuss in detail about Man-Machine Systems: Design, Characteristics and Classification.

OR

b. Discuss in detail about the anthropometric division of body types.

SL.NO:1111

SL.NO:1110

SUBJECT CODE:17MESE31

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING
ELECTIVE - TURBOMACHINERY

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List out the fluid flowing methods in turbo machines.
- 2 Define Nozzle.
- 3 List out the types of turbines.
- 4 Define degrees of reaction.
- 5 Define throat.
- 6 What is the function of diffusers in a centrifugal compressor?
- 7 What is low reaction stage?
- 8 Define transonic flow.
- 9 What is windage losses?
- 10 What is zero reaction stage?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. The impeller tip speed of a centrifugal compressor is 370 m/s, slip factor is 0.90, and the radial velocity component at the exit is 35 m/s. If the flow area at the exit is 0.18m² and compressor efficiency is 0.88, determine the mass flow rate of air and the absolute Mach number at the impeller tip. Assume air density = 1.57 kg/m³ and inlet stagnation temperature is 290 K. Neglect the work input factor. Also, find the overall pressure ratio of the compressor.

OR

- b. An axial flow compressor stage has the following data:
Air inlet stagnation temperature: 295K
Blade angle at outlet measured from the axial direction: 32°
Flow coefficient: 0.56
Relative inlet Mach number: 0.78
Degree of reaction: 0.5
Find the stagnation temperature rise in the first stage of the compressor.

(p.t.o)

- 12 a. A small inward radial flow gas turbine operates at its Design point with a total-to-total efficiency of 0.90. The stagnation pressure and temperature of the gas at nozzle inlet are 310 kPa and 1145K respectively. The flow leaving the turbine is diffused to a pressure of 100 kPa and the velocity of flow is negligible at that point. Given that the Mach number at exit from the nozzles is 0.9, find the impeller tip speed and the flow angle at the nozzle exit.
Assume that the gas enters the impeller radially and there is no whirl at the impeller exit. Take $C_p = 1.147 \text{ kJ/kgK}$; $\gamma = 1.333$:

OR

- b. Explain the operation and construction of Jet pump.
- 13 a. Compare the turbo machines with positive displacement machines for their features.

OR

- b. Define turbo machine. What are the main differences between incompressible and compressible flow machines?
- 14 a. Describe the industrial applications of Gas turbines, Compressors and low pressure fans
Understand

OR

- b. Illustrate with a neat sketch explain about the Fan performance in detail.
performance in detail.

- 15 a. Explain the various losses of fans in detail.

OR

- b. Demonstrate briefly with the aid of illustrative sketch of centrifugal blower.

- 16 a. Explain the terms “slip factor” and “power input factor” in detail.

OR

- b. Explain the phenomenon of stalling, surging and choking in centrifugal compressors.

- 17 a. What is an airfoil? Explain with a sketch, the various terms used in airfoil geometry

OR

- b. Explain the Reaction ratio equation in detail.

- 18 a. Illustrate with a neat sketch explain the multistage velocity-compound turbine.

OR

- b. Discuss in detail about the single impulse turbine with a neat sketch.

(p.t.o)

Answer ALL questions**PART-C (2 x 15 = 30)**

- 19 a. In a three stage turbine the pressure ratio of each stage is 2 and the stage efficiency is 75%,.Calculate the overall efficiency and the power developed if the air is initially at a temperature of 6000C flows through it at the rate of 25kg/sec. Find reheat factor.

OR

- b. Air flows through a blower , its total pressure is increased by 15 cm of water head. The inlet total pressure and temperature are 105 KPa and 15° C . The total –to –total efficiency is 75%. Evaluate:
- 1) Exit total pressure and temperature and
 - 2) Isentropic and actual change in total head enthalpy. Assume 50% reaction.
- 20 a. An axial compressor stage has mean diameter 600 mm and runs at 250rps . The actual temperature rise is 30° C and the pressure ratio is developed is 1.35. Initial pressure is 35°C and the temperature rise in the rotor is 20°C. Mass flow is 50 kg/sec and the mechanical efficiency is 85% , determine,
- a) Power required to drive the compressor
 - b) Loading co-efficient
 - c) Degree of reaction
 - d) Stage efficiency

OR

- b. The blade speed of an axial flow turbine is 300m/sec. The mass flow rate is 2.5kg/sec. The gas temperature at turbine inlet and outlet are 5000C and 3000C respectively. The fixed blade outlet angle is 70°. Axial velocity remains constant at 200m/sec, Draw the velocity triangle and determine the power developed, degree of reaction and blade efficiency. Assume CP of gases 1.05J/Kg0K

SL.NO:1109

SUBJECT CODE:17MESE05

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022

ELECTIVE : WASTE ENERGY CONVERSION TECHNOLOGIES

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 How the waste is classified?
- 2 What is LCA for MSW?
- 3 How long does it take to decompose for plastic?
- 4 What are the classifications of landfills?
- 5 What is pyrolysis?
- 6 Why should we recycle the waste?
- 7 What are the four types of biomass that can be converted to energy?
- 8 What is refuse-derived fuel (RDF)?
- 9 What is meant by briquetting?
- 10 What are the rules and regulations for MSW in India?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Discuss in detail with a flow chart on how the wastes are collected and transported.
OR
b. Explain the methods of processing the waste.
- 12 a. Describe about the characterization of biomedical waste
OR
b. What are the common methods of waste disposal and explain each in detail.
- 13 a. What are the types of incinerators and explain any one type in detail.
OR
b. Illustrate with a neat sketch, explain aerobic and anaerobic composting of municipal solid waste.

(p.t.o)

14 a. Explain in detail about layout and preliminary designs of landfill.

OR

b. Define pyrolysis and explain in brief with a neat diagram of any one pyrolysis process.

15 a. Discuss in detail about the environmental impact of incineration process.

OR

b. Explain in detail about the benefits of waste to energy, utilization of bottom ash from incineration process.

16 a. Explain in detail about anaerobic digestion of municipal waste.

OR

b. Discuss in detail on industrial waste and agro waste.

17 a. How the waste to energy can be implemented in villages? Explain in detail.

OR

b. Explain the methods of implementing the energy conversion in cities.

18 a. Explain the rules and regulations formulated for handling and disposal of MSW in India

OR

b. Explain the rules and regulations formulated for handling and treatment of BMW in India

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain and discuss in detail about the characterization of municipal solid waste, Industrial waste and Biomedical waste.

OR

b. What are the types of incinerators and explain any three types in brief.

20 a. Explain in detail about the anaerobic digestion of sewage and municipal waste.

OR

b. Explain the rules and regulations formulated for handling, treatment and disposal of Biomedical Waste in India

SL.NO:1109

SL.NO:1117

SUBJECT CODE:17MEEC13

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - INDUSTRIAL SAFETY

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Analysis the Environmental Assessment using GIS?
- 2 Analysis the importance of electricity act.
- 3 Analysis the importance of IBA.
- 4 Define trauma. Give its importance.
- 5 Define thermal pollution.
- 6 What is the relation between safety and productivity.
- 7 Discuss about frequency rate.
- 8 Summarize any two toxic gases and chemicals.
- 9 Illustrate the names of any two material handling equipment's.
- 10 Categorize the safety guidelines while selecting eye protective equipment.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Show the various safety measures in material handling and storage.
OR
b. Infer the various first aid procedures for fire accident victims.
- 12 a. Examine various safety measures in ensuring road safety.
OR
b. Categorize various causes of occupational diseases.
- 13 a. Outline about the Factory act 1948.
OR
b. Determine the various industrial pollution controls.
- 14 a. Breakdown the various personal protective equipment's.
OR
b. Analyze the industrial Hygiene.

(p.t.o)

2

15 a. Discuss in detail about the functions of safety management.

OR

b. Summarize various types and levels of safety committee.

16 a. Explain safety and productivity including the cost elements involved.

OR

b. Explain the various safety measures in gas furnace safety operation.

17 a. Discuss about the hot metal operations and safety measures.

OR

b. Explain various safety measures in Machine shop.

18 a. Interpret the various safety measures in Grinding and explain grinding operation elaborately.

OR

b. Classify the salient features of Indian Boiler Act.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Show the various safety measures in material handling and storage.

OR

b. Determine the general recommendations for physical control of the hazards in your choice of personnel protective equipment.

20 a. Summarize the objectives of safety committee? When do we conduct safety audit? Explain the performance measurement and motivation taken by the organization to implement safety programs?

OR

b. Summarize the detailed check list for ensuring the safe operation of vertical machining center.

SL.NO:1117

SL.NO:1108

SUBJECT CODE:17MABS16

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

NUMERICAL METHODS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define transcendental equation
- 2 When *Gauss-Elimination method* may fail?
- 3 When *Bessel's* formula is to be used?
- 4 State *Inverse Lagrange's* Interpolation Formula.
- 5 Explain Numerical Differentiation.
- 6 How will you improve the accuracy in the *Trapezoidal Rule*?
- 7 How many prior values are required to predict the next value in Adam's method?
- 8 Write the third order *Runge-Kutta method* algorithm to find the numerical solution of the first order differential equation.
- 9 What is different methods for solving Boundary Value Problem.
- 10 Solve $xy'' + y = 0$, $y(1) = 1$, $y(2) = 2$ with $h = 0.5$

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Evaluate $\sqrt{12}$ to four decimal places by *Newton - Raphson* method

OR

- b. Solve the following system of equations by Gauss Seidel method
- $$\begin{aligned} 8x + y + z &= 8 \\ 2x + 4y + z &= 4 \\ x + 3y + 5z &= 5 \end{aligned}$$

(p.t.o)

- 12 a. Using *Newton's Divided Difference Formula* to find the value of $\log_{10} 656$. Given $\log_{10} 654 = 2.8156$, $\log_{10} 658 = 2.8182$, $\log_{10} 659 = 2.8189$, and $\log_{10} 661 = 2.8202$.

OR

- b. Using *Newton's Forward Interpolation Formula*, evaluate y at $x=5$.

x	4	6	8	10
y	1	3	8	10

- 13 a. Solve $\int_0^6 \frac{dx}{1+x^2}$ by using *Simpson's* $\frac{1}{3}$ and $\frac{3}{8}$ rule by dividing interval into 6 equal parts.

OR

- b. Using *Gaussian three-point formula*, evaluate $\int_1^5 \frac{dx}{x}$

- 14 a. Apply the *Runge-Kutta method* of fourth order, to find $y(0.2)$, given $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$, $h = 0.2$.

OR

- b. Apply the *Runge-Kutta method* of fourth order, to find $y(0.1)$, $y(0.2)$, given $\frac{dy}{dx} = \frac{1}{2}(1+x)y^2$, $y(0) = 1$.

- 15 a. Solve the equation $y'' - xy = 0$ given $y(0) = -1$, $y(1) = 2$ by finite difference method taking $n=2$.

OR

- b. Solve by finite difference method, the boundary value problem $\frac{d^2y}{dx^2} - y = 0$ with $y(0) = 0$ and $y(2) = 4$ choosing $\Delta x = 0.5$

- 16 a. Using the *Simpson's rule*, evaluate $\int_1^2 \int_1^2 \frac{1}{x+y} dx dy$ by dividing into two equal sub intervals.

OR

- b. Use of *Romberg's method*, to compute $I = \int_0^1 \frac{dx}{1+x}$ correct to 4 decimal places. Hence find $\log_e 2$.

- 17 a. Find the inverse of a matrix $\begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ by Gauss Jordan method

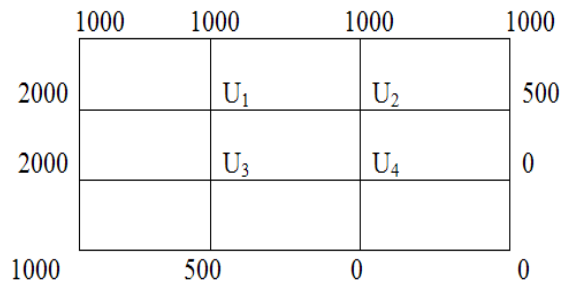
OR

- b. Solve $\frac{dy}{dx} = x + y$, given $y(1) = 0$, Find $y(1.1)$ and $y(1.2)$ by Taylor's series method

- 18 a. Solve $\frac{dy}{dx} = \frac{1}{2}(x + y)$, given $y(0) = 2$, $y(0.5) = 2.636$, $y(1) = 3.595$ and $y(1.5) = 4.968$ by using Milne's method find to $y(2)$

OR

- b. Solve the Laplace equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown.



Answer ALL questions
PART-C (2 x 15 = 30)

- 19 a. Using Gauss – Jordan method to solve the following system.

$$\begin{aligned} x + 2y + z &= 3 \\ 2x + 3y + 3z &= 10 \\ 3x - y + 2z &= 13 \end{aligned}$$

OR

- b. Using the Bessel's formula, to obtain the value of $y(5)$, given

x	0	4	8	12
$f(x)$	143	158	177	199

4

20 a. Using *Modified Euler method*, Find $y(0.1)$, $y(0.2)$, given $\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$.

OR

b. Solve $y'' - y = x$, $x \in (0,1)$ given $y(0) = y(1) = 0$, using finite differences dividing the interval into 4 equal parts.

SL.NO:1108

SL.NO:1101

SUBJECT CODE:17MEPI03

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - NOISE, VIBRATION AND HARSHNESS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define resonance.
- 2 List the vehicle noises that are usually tested as per regulation.
- 3 Define the structure borne sound.
- 4 List Difference between vibration and Noise.
- 5 Name the standards in noise measurement.
- 6 Define traffic noise.
- 7 Explain the different types of vibrations.
- 8 Explain about geartrain noise
- 9 Discuss about noise measurement transducers.
- 10 Explain about various acquisition techniques adopted.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. A harmonic exciting force of 25N is acting on a machine part which is having a mass of 2Kg and vibrating in viscous medium. The exciting force causes resonant amplitude of 12.5mm with a period of 0.2sec.

OR

 - b. Explain about Truck Intake and Exhaust Noise.
- 12 a. Deduce the expression for the free longitudinal vibration in terms of spring stiffness, its inertia effect and suspended mass.

OR

 - b. Derive the expression for torsional vibration.
- 13 a. Explain the different types of vibration isolation methods.

OR

 - b. List the approaches of diesel engine system design to NVH?
- 14 a. Explain about piston slap noise and piston assembly dynamics modeling for piston slap.

OR

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b. Explain the Following sound Measuring instruments.

a) Microphones b) Noise Dosimeters

15 a. Illustrate with neat sketch explain the sound level meter.

OR

b. What is meant by Transmissibility? Explain the various types.

16 a. Discuss about the importance of vibrations

OR

b. Summarize the different types of vibration monitoring techniques.

17 a. Describe about procedure to stationary vehicle test and list the equipments used.

OR

b. Explain different types of Vibration and Noise Measurement Transducers.

18 a. Explain about passenger car noise.

OR

b. Give Short Notes About-a) Tire Noise And Their Control Methods,b)Brake Noise.c)Noise Control Strategy

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. The support of a spring mass system is vibrating with amplitude of 6 mm and a frequency of 1200 cycles/min. If a mass is 95 kg and the spring has a stiffness of 1950 N/m, determine the amplitude of vibration of the mass.

If a damping factor of 0.2 is include, what would be the amplitude?

OR

b. Explain the Engine Noise with suitable reasons.

20 a. Discuss in detail about Vehicle and powertrain noise, vibration, and harshness (NVH).

OR

b. Explain the working of various types of transducers with neat sketch used in vibration and noise measurement.

SL.NO:1101

SL.NO:1097

SUBJECT CODE:17MESE39

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-LEAN MANUFACTURING SYSTEMS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Give the various principles of lean manufacturing.
- 2 What is meant by value added activity?
- 3 What is meant by Seiketsu?
- 4 Define overall equipment effectiveness.
- 5 State the merits of JIT system.
- 6 State the limitations of VSM
- 7 Give some examples for poka yoke systems.
- 8 What do you understand by special cause variation.
- 9 What are the activities of quality circles?
- 10 What is meant by SWOT analysis?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Compare and contrast the lean manufacturing system with conventional manufacturing system.
OR
b. Explain the origin of lean production system in detail.
- 12 a. Enumerate the advantages and limitations of lean manufacturing system.
OR
b. Illustrate Work Combination Chart for any process and explain it in detail.
- 13 a. What is meant by cell layout? Explain the various types of layouts with neat diagram.
OR
b. Explain the Jishu Hozen and office TPM with illustrations.
- 14 a. Outline the following 1.Autonomous maintenance 2.Planned maintenance 3.Quality maintenance
OR
b. Discuss the purpose of value stream mapping

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15 a. Explain the significance of pull system over the push system in lean manufacturing.

OR

b. Discuss about the merits and limitations of VSM.

16 a. Discuss about the implementation of Jidoka.

OR

b. Explain the Mistake proofing device and Critical condition device with an example.

17 a. Explain the implications and advantages of implementing Poka-Yoke system.

OR

b. Describe the procedure for implementing Poka Yoke system.

18 a. What is strategic planning? Explain in detail.

OR

b. Classify the different types of kaizen activities. Explain in detail.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Describe the pillars of TPM with illustrations.

OR

b. Enumerate the elements of JIT manufacturing system.

20 a. Explain the different types of Poka Yoke system.

OR

b. Enumerate the various aspects of lean culture.

SL.NO:1097

SL.NO:1096

SUBJECT CODE:17MESE24

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-COMBUSTION ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List the types of fuels.
- 2 Define octane number?
- 3 Define product of combustion.
- 4 Define steady flame.
- 5 State Arrhenius equation.
- 6 Identify chain branching reaction.
- 7 Define flammability.
- 8 List some practical examples of premixed laminar flames.
- 9 Write a short note on NO_x emissions.
- 10 Tell about laminar jets.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Differentiate between laminar flame and turbulent flame. Explain in detail.
OR
b. Discuss about the presence of a catalyst that influences reaction rates.
- 12 a. Discuss the effect of equivalence ratio on flame speed? Explain briefly.
OR
b. Discuss the effects of NO_x emissions.
- 13 a. Discuss about the relationship between incomplete combustion and the atmosphere?
OR
b. Discuss, How would you calculate rate constant? Give an example and explain them briefly.
- 14 a. Summarize short notes on (i) flame velocity (ii) flame thickness.

OR

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- b. Illustrate neat sketches and explain the following
(i) laminar flame (ii) turbulent flame

- 15 a. Discuss the structure of diffusion flame from laminar jets? Explain in detail.

OR

- b. Explain primary fuels with examples.

- 16 a. Illustrate with a neat sketch Explain premixed flame

OR

- b. Describe combustion stoichiometry with an example.

- 17 a. Differentiate between enthalpy and entropy in detail.

OR

- b. Summarize a short note on the following. (i) Chemical kinetics (ii) Reaction rates

- 18 a. Explain droplet combustion. Discuss in detail about evaporation of droplet.

OR

- b. Differentiate between premixed turbulent flame and diffusion turbulent flame? Explain in detail.

Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. Discuss the effects of pollutants in detail.

OR

- b. Illustrate with neat sketches explain the structure of different premixed flames.

- 20 a. Describe the fractional distillation process with a neat sketch.

OR

- b. Describe a simple model for evaporating and burning droplet.

SL.NO:1096

SL.NO:1095

SUBJECT CODE:17MESE18

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-METAL FORMING AND JOINING PROCESS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define Workhardening.
- 2 Define Cold working.
- 3 What is closed die forging?
- 4 List the types of extrusion.
- 5 What is arc welding?
- 6 What is the purpose of flux?
- 7 List the advantages of SAW welding.
- 8 What is stainless steel?
- 9 Define hot cracking.
- 10 Classify the types of electrodes.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain any one Cold working process with suitable sketch.
OR
b. Explain detailed about the warm hardening process.
- 12 a. Discuss in detailed about the work hardening.
OR
b. Explain recrystallization process in metal forming.
- 13 a. Explain the direct extrusion process with neat sketch.
OR
b. Describe hydrostatic extrusion process.
- 14 a. Explain hot extrusion and its types with a neat sketch.
OR
b. Explain the Gas Tungsten Arc welding with a neat sketch.
- 15 a. Explain the Gas cutting with a neat sketch.

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OR

b. Briefly explain flame characteristics of gas welding process with a neat sketch.

16 a. Describe friction welding with a neat sketch.

OR

b. Describe about upset and flash butt welding process.

17 a. Enumerate in detail about the advantages and disadvantages, Applications of laser beam welding.

OR

b. Describe in detail about seam welding process and discuss its advantages.

18 a. Briefly explain the process of joining martensitic materials.

OR

b. Explain the sensitisation process.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Discuss hot working of metals with a neat sketch.

OR

b. Explain the Rolling process in detail.

20 a. Discuss Electro gas welding with neat sketch.

OR

b. Explain in detail about cold cracking process with neat sketch.

SL.NO:1095

SL.NO:1094

SUBJECT CODE:17MESE13

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-GEOMETRIC MODELLING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define Computer Graphics.
- 2 What is homogeneous coordinate representation?
- 3 Define "Concatenation of transformations".
- 4 What are synthetic curves?
- 5 State the advantages of B-rep.
- 6 Define control polygon of a curve.
- 7 Mention any two surface removal algorithm.
- 8 List out some entities for design of solids.
- 9 How the visual realism of images can be enhanced?
- 10 Show the line entities in 2D drafting.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Describe Graphical Primitives with a neat sketch used for Computer graphics.
OR
b. Summarize short notes on Parallel line algorithm.
- 12 a. Extend about the area fill algorithm.
OR
b. Outline the following i) Rendering & ii) Shading in computer graphics.
- 13 a. Explain Orthographic projection in detail.
OR
b. Describe 2D reflection with the Matrix.
- 14 a. Compare between Parallel and Perspective Projection in detail.
OR
b. Demonstrate the properties of B-Spline curve.
- 15 a. Summarize a short note on Knot vector generation.

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OR

b. Summarize a short note on sub-division of Bezier curve

16 a. Summarize a short note on “16 point form” in design of surfaces.

OR

b. Describe construction of “Coons patch”.

17 a. Explain briefly about surface of revolution.

OR

b. Explain computer animation and its applications.

18 a. Briefly explain about animation and design application.

OR

b. Describe the various light sources with example.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain DDA algorithm in generation of a line.

OR

b. Explain de Casteljaou's algorithm in evaluation of polynomial.

20 a. Describe the CSG model with suitable example.

OR

b. Describe ‘Pseudo code’ algorithm for 2D animation.

SL.NO:1094

SL.NO:1093

SUBJECT CODE:17MESE04

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-RENEWABLE SOURCES OF ENERGY

Time : Three Hours

Maximum Marks:100 Marks

Answer ALL questions
Part-A (10 x 2 =20 Marks)

- 1 What is diffuse radiation?
- 2 List the basic components of solar water pump.
- 3 What is the minimum wind speed required for generating electricity in a wind mill?
- 4 List the various forms of renewable energy.
- 5 How much methane content (in %) available in bio gas?
- 6 What is Bio-mass?
- 7 List the basic types of water turbines.
- 8 Define energy.
- 9 List the two important new energy sources.
- 10 Identify the wind power equation.

Answer Any FIVE questions
Part-B (5 x10 =50 Marks)

- 11 a. Discuss about the applications of solar photo-voltaic system in Rural Areas.
OR
b. Discuss the economic benefits of bio gas utilization.
- 12 a. Discuss the main environmental impacts of OTEC-like technologies relation.
OR
b. Explain the solar thermal power plant with neat sketch.
- 13 a. Explain briefly about solar water pump with the help of a neat sketch.
OR
b. Describe in detail about the principle of liquid flat plate solar collector.
- 14 a. Explain the essential features of probable site for a wind form.
OR
b. Explain the “Nearly constant speed - constant frequency” system.
- 15 a. Discuss about hybrid system in wind power.

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OR

b. Explain briefly about the material requirement for construction of Bio gas production.

16 a. Explain the details of down-draught and cross-draught gasifier.

OR

b. Explain the Applications of GIS in geo-sciences.

17 a. Explain the Factors affecting the tidal power plant.

OR

b. Explain the Life cycle analysis of renewable energy.

18 a. Explain the National energy policy.

OR

b. Describe the thermo-chemical method of hydrogen production.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the principles of operations of different types of solar collectors, with neat sketch.

OR

b. Discuss the hydrogen generation, storage methods and its transportation and utilization.

20 a. Explain briefly about wind farm and draw with neat diagram about how the wind farm is located?

OR

b. Explain in detail about different energy storage methods and with a neat sketch explain any one in detail.

SL.NO:1093

SL.NO:1086

SUBJECT CODE:17MESE49

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE- PROCESS PLANNING AND COST ESTIMATION

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is meant by “SIMO” chart?
- 2 List the objectives of the study of ergonomics.
- 3 What is meant by process planning?
- 4 What are the two general approach of process planning?
- 5 What do you mean by a realistic estimate?
- 6 What are the components of cost?
- 7 Define multiple cost method.
- 8 Discuss the various causes of depreciation.
- 9 Define Cutting speed.
- 10 What is shrinkage allowance?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. A manufacturing firm has total overheads of Rs.1, 20,000 and total prime cost Rs.2.5 lacs for the year 2002-03. Find out the share of overheads to be allocated to products A and B by proportional to prime cost method using the following data.

	Product A	Product B
Direct material cost	Rs. 900	Rs.1000
Direct labour cost	Rs. 700	Rs.600
Direct other expenses	Rs. 300	Rs.250

OR

- b. A 3 cm deep slot is to be milled with a 8 cm diameter cutter. The length of the slot is 30 cm. What will be the total table travel to complete the cut? If the cutting speed is 20 meters/min and feed per tooth is 0.2 mm, examine the milling time. The cutter has 24 teeth and one cut is sufficient for the slot.

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- 12 a. A 15 cm long M.S bar is to be turned from 4 cm dia in single cut in such a way that for 5 cm length its dia is reduced to 3.8 cm and remaining 10 cm length is reduced to 3.4 cm. Estimate the total time required for turning it assuming cutting speed as 30 m/min., feed as 0.02 cm/revolution and time required for setting and Mounting of the job in a three jaw chuck is 30 sec. Neglect the tool setting time. Examine the time required for knurling 5 cm length at 20 m/min and feed 0.03 cm/rev.?

OR

- b. Estimate the planning time for a casting 1.25m long and 0.5m wide which is machined on a planner having cutting speed of 12m/min and a return speed of 30m/min. Two cuts are required, one roughing with a depth of 3.125mm and a feed of 0.1mm/rev and other finishing with a depth of 0.125mm and using a feed of 0.125mm.
- 13 a. What are the various symbols of process chart? Write and explain briefly.

OR

- b. List out the various steps in conducting a stop watch time study. Explain briefly.
- 14 a. Draw and explain cyclograph and chronocyclegraph.

OR

- b. Explain in detail the activities of process planning.
- 15 a. Explain the factors to be considered for selecting machines and materials.

OR

- b. Explain Retrieval approaches process planning with suitable example.
- 16 a. What is the purpose of costing? Explain "Why costing is essential to industrial control".

OR

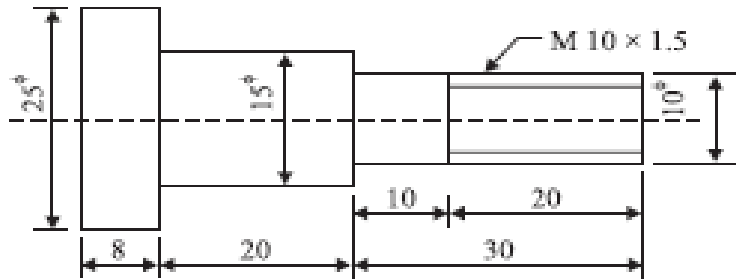
- b. Explain about various methods of costing.
- 17 a. Explain the constituents of estimation.

OR

- b. Name the various elements of cost? Explain each element in detail giving suitable example.
- 18 a. Explain the procedure for Estimation of Material cost.

OR

- b. Estimate the machining time required to produce one piece of the component shown in Fig. starting from 25 mm bar. The following data is available



For turning:

Cutting speed = 40 m/min. Feed = 0.4 mm/rev. Depth of cut = 2.5 mm/per pass

For thread cutting:

Cutting speed = 8 m/min

p.t.o

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Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. A factory has a capacity to produce 1000 shapes/annum. But at present it is working at its 70% capacity. The sales income at this level is Rs 52,50,000. The fixed cost of the factory is Rs 20,00,000 and variable cost per piece is Rs 2500. There is a proposal for mechanization but this will increase the fixed cost by Rs 40,000 and will reduce the variable cost by Rs 500 per unit. Estimate (a) whether the proposal is economical, (b) If a reduction in selling price by Rs 200 per unit makes the factory to run at 85% of its full capacity, would this be a better proposal than the first one.

OR

- b. Two plates each 1.2 m long and 8 mm thick are to be welded. A 60° Vee is prepared by means of gas cutting before welding is to be commenced. The cost of oxygen is Rs. 9/m³ and of acetylene Rs. 45/. The labor charges are Rs. 4 per hour. The filler metal costs Rs. 11/kg. Using rightward technique, find the cost of cutting and welding. Take density of filler metal as 10 gm/cc. The following data is also available :

For cutting (for 10 mm thick plate):

- Cutting speed = 20 m/hr
 Consumption of oxygen = 2 m³/hr
 Consumption of acetylene = 0.2 m³/hr

Data for rightward welding (for 8 mm thick plate):

- Consumption of oxygen = 0.78 m³/hr
 Consumption of acetylene = 0.8 m³/hr
 Diameter of filler rod used = 4 mm
 Rate of welding = 2.25 m/hr
 Filler rod used per meter of weld = 3.4 m

- 20 a. Justify the importance of process planner to have a good knowledge of materials used in manufacturing.

OR

- b. For manufacturing a milling machine, the expenditure is tabulated in table

Sl.No. Particulars Expense in Rs.

- 1 Material consumed 46,000
- 2 Indirect factory wages 7,000
- 3 Directors fees 2,500
- 4 Advertising 8,000
- 5 Net profit 11,750
- 6 Depreciation on sales department's car 900
- 7 Printing and stationary 350
- 8 Depreciation on plant 4,200
- 9 Direct wages 59,000
- 10 Factory rent 5,750
- 11 Telephone and postal charges 250
- 12 Gas and electricity 400
- 13 Office salaries 2,000
- 14 Office rent 600
- 15 Show room rent 1,200
- 16 Salesman's commission 1,850
- 17 Sales department car expenses 1,200

Find out (a) prime cost, (b) Factory cost, (c) Total cost of production

(d) cost of sales and (e) selling price.

SL.NO:1086

SL.NO:1085

SUBJECT CODE:17MESE35

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-NANOSTRUCTURED MATERIALS AND ITS APPLICATIONS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Discuss briefly about implication of nanotechnology in Chemistry.
- 2 Mention the operation of planetary ball mill process.
- 3 Define quantum dots.
- 4 Describe porous silicon is useful in electronics.
- 5 Define sol-gel method.
- 6 Define lithography.
- 7 Express the advantages of X-ray lithography.
- 8 Distinguish lithography and etching.
- 9 Outline the process of inert gas condensation
- 10 Mention the various kinds of plasma assisted CVD techniques.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Write a note on thin films and multilayered materials. Discuss any two methods of thin film deposition techniques in detail.
OR
b. Explain the classification of nanostructures materials in the context of Quantum confinement in detail.
- 12 a. Describe the recent trends in nanoscience and technology in the field of textile, agriculture and medicine.
OR
b. Discuss the effect of size reduction on the various properties of a material with examples.
- 13 a. Draw suitable illustration and explain about the classification of nano materials.
OR
b. Illustrate Physical Vapour Deposition technique with a neat diagram.
- 14 a. Illustrate the method of growing thin film using evaporation technique.

OR

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b. Determine the various factors which cause toxic and biohazards

15 a. Describe the principle of dry etching process and explain about plasma etching.

OR

b. Illustrate the two classes of etching process in detail.

16 a. Illustrate the process of electron beam lithography with neat sketch.

OR

b. Discuss mechanical property of CNT with an example.

17 a. Explain briefly the principle of nano-drug delivery.

OR

b. Explain briefly the principle of nanomagnetic data storage.

18 a. Write about molecular nano technology. Explain in detail.

OR

b. How to prepare nano fluid? Explain any three methods for producing nanofluids.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Illustrate the method of growing a thin film using Molecular Beam Epitaxy with its advantages.

OR

b. Illustrate etch resists method and mention its applications.

20 a. Explain the Sol-gel method of synthesizing nanoparticles in detail with its advantages and disadvantages.

OR

b. Describe in detail about the principle, construction, working and application of MOMBE.

SL.NO:1085

SL.NO:1077

SUBJECT CODE:17MEP104

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE-NON DESTRUCTIVE TESTING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Summarize the filters in radiographic testing.
- 2 Discuss list of ultrasonic inspection techniques in UT.
- 3 Interpret the sections of the characteristics curve of X-ray film.
- 4 Define the term "Crompton effect".
- 5 Examine the factors affecting mechanical properties of materials.
- 6 Define Bore scope.
- 7 What is liquid penetrant testing?
- 8 List various steps involved in magnetic particle testing.
- 9 List the characteristics of Infrared waves.
- 10 Define the principle of hall effect

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Examine with a case study discuss the applications of material characterization.
OR
b. Examine the factors influencing the selection of NDT methods.
- 12 a. Explain the following: (i) Application of visual inspection. (ii) Advantages and disadvantages of visual inspection.
OR
b. Discuss about the physical principles of liquid penetrant testing with neat sketch. Also bring out the advantages and limitations of the liquid penetrant testing.
- 13 a. (i) Explain about various types of developers.
(ii) List out various characteristics of developers.
OR
b. Discuss about water washable and post emulsifiable-hydrophilic methods in liquid penetrant testing using process flow diagram.

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14 a. Explain about dry and wet particle inspection techniques with neat diagram

OR

b. Describe in detail about the elements of infrared detection system with block diagram

15 a. Describe classification of Infrared sensors and explain with neat sketch about working principle of IR sensors.

OR

b. Describe about Contact and Non-Contact inspection methods in Thermography with neat sketch.

16 a. Explain with neat sketch about the arrangement of Acoustic emission testing setup

OR

b. Discuss the following Ultrasonic inspection technique with neat sketch. (i) Straight beam ultrasonic inspection method (ii) Angle beam ultrasonic inspection method.

17 a. Explain the principle of Acoustic emission test with neat sketch and List the applications of Acoustic emission test.

OR

b. Explain in detail about Xerography techniques with suitable sketch.

18 a. Describe radiographic imaging techniques with suitable sketch.

OR

b. Discuss the components of X-ray generator with suitable sketch.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the following with suitable sketch:

(i) Elasticity (ii) Hardness (iii) Brittleness (iv) Ductility (v) Malleability

OR

b. Associate the procedure of corrosion detection in Eddy current testing of Non destructive testing.

20 a. Explain about various parameters involved in Acoustic Emission Testing method of Non destructive testing.

OR

b. Summarize the components of Acoustic emission test. Illustrate with neat sketch about the arrangement of Acoustic emission testing setup.

SL.NO:1077

SL.NO:1067

SUBJECT CODE:17MESE38

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - INDUSTRIAL ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 What is the purpose to increase the productivity for workers?
- 2 Write two applications of flow process chart.
- 3 State the principle of material handling.
- 4 What do you meant by plant location?
- 5 What do you understand by the term scheduling?
- 6 What is meant by sequencing?
- 7 What are the benefits of MRP?
- 8 What is the different phase of bench marking?
- 9 State break- even point.
- 10 List out any three recruitment tests used in selecting employees

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Explain the various factors are considered for the selection of a site for a plant.

OR

- b. Explain the various principles of material handling.

- 12 a. What are the various phases involved in plant layout procedure? Explain in detail.

OR

- b. Explain the combination and fixed position layout with suitable example and sketch.

- 13 a. Classify the Forecasting Techniques. Explain with suitable example in any two techniques.

OR

- b. Explain the Dispatching procedure, and also explain the centralized and decentralized dispatching. Give the advantages, disadvantages and applications

(p.t.o)

14 a. What do you understand by production planning and control? Discuss its main elements or functions

OR

b. Explain the MRP system. Discuss different inputs and outputs of MRP.

15 a. Explain the significance of ABC analysis. How is it helpful in the inventory control.

OR

b. What do you understand by inventory control? Explain the purpose of maintaining inventory in any production unit

16 a. Describe the following

- a. Limited Partner
- b. Minor partner

OR

b. Explain the Quantitative methods in decision making.

17 a. Explain the steps involved in break even analysis. What are the advantages and Limitations of break even analysis?

OR

b. What are the factors affecting productivity? Explain in detail.

18 a. List out the various steps in conducting a stop watch time study. Explain.

OR

b. Write notes on the following

- i. Design of man machine systems and
- ii. Design of working environment

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Discuss briefly the evolution and importance of industrial engineering.

OR

b. Describe the purpose and uses of merit rating.

20 a. Write short notes on i) loading chart , ii)route card , iii) material requisition

OR

b. Differentiate EMQ and EOQ.

SL.NO:1066

SUBJECT CODE:17MESE27

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - POWER PLANT ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Name few accessories of thermal power plant.
- 2 What are the advantages of bin or central system.
- 3 What is nuclear fission?
- 4 List out any two disadvantages of hydro electric power plant.
- 5 List few characteristics of Diesel power plant.
- 6 What are the different methods of producing electricity with tides?
- 7 What are the components of tidal power plant?
- 8 What are the power cycles employed in solar thermal power generation?
- 9 What is meant by cost analysis?
- 10 Define plant use factor.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. The air enters the compressor of an open cycle constant pressure gas turbine at a pressure of 1 bar and temperature of 20°C. The pressure of the air after compression is 4 bar. The isentropic efficiencies of compressor and turbine are 80% and 85% respectively. The air fuel ratio used is 90:1. If the flow rate of air is 3.0 kg/S, find the Power developed. Assume $C_p=1.0\text{kJ/kg K}$ and $\gamma=1.4$ for air and gases; Calorific value of fuel = 41800 kJ/kg.

OR

- b. Determine the annual cost of diesel power station from the following data:
Capital cost = Rs 60x 105
Salvage value =6%
Life = 20 years
Annual repair and maintenance cost = Rs 32000

(p.t.o)

- 12 a. The output of a generating station is 12 MW and annual load factor is 0.58. The annual cost of a fuel for running the plant is Rs 12 x10⁵ and the annual wages and taxes are Rs 10x10⁵. The capital cost of the plant is Rs 700x10⁵ and interest and depreciation charges are made 10% of capital cost per annum. Determine the cost of generation.

OR

- b. Explain about Hydrograph in detail.
- 13 a. Discuss the advantages and disadvantages of hydro electric power plant briefly.

OR

- b. Explain pressurised water reactor with a neat sketch.
- 14 a. Explain the factors to be considered for Nuclear power plant site selection.

OR

- b. Explain the common rail injection system in detail.
- 15 a. Explain "Turbo Charging" and "Gas Generator".

OR

- b. What is supercharging? Explain the methods of supercharging diesel engines.
- 16 a. Discuss the principle of OTEC power plant with a neat sketch.

OR

- b. Explain the solar pond technology.
- 17 a. Explain the electrical equipment layout with neat sketch.

OR

- b. What are the different types of pulverizing mills? Explain any one.
- 18 a. Explain pulverized coal firing system.

OR

- b. Illustrate the different types of coals.

(p.t.o)

Answer ALL questions
PART-C (2 x 15 = 30)

19 a. The following data pertain to a power plant:

Installed capacity = 200MW

Capital cost = Rs.350 x 10⁷

Annual cost of fuel, taxes and salaries = Rs.55 x 10⁷

Rate of interest = 5% of the capital

Rate of depreciation = 6% of the capital

Annual load factor = 0.65

Capacity factor = 0.56

Energy used in running the plant auxiliaries = 4% of total units generated.

Determine (a) The cost of power generation (b) The reserve capacity.

OR

b. Explain the stages in Coal handling process.

20 a. Explain the different factors to be considered while selecting a site for Hydro Electric power plant.

OR

b. Explain the vertical axis wind machines. Mention the advantages and disadvantages.

SL.NO:1065

SUBJECT CODE:17MESE10

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - DESIGN FOR MANUFACTURING AND ASSEMBLY

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define Tolerance stack.
- 2 Define casting process.
- 3 State the need for reduction of machined area.
- 4 Illustrate how the machined areas can be reduced.
- 5 List out the factors considered for assembly methods.
- 6 Define bill of material.
- 7 Write a short note about process capability.
- 8 State the design factors in DFMA.
- 9 What is meant by amalgamation process.
- 10 Define interface in assembly.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Develop various evaluation methods used for manufacturability in DFMA.

OR

- b. Describe with neat sketch about the manufacturing datum, functional datum & change in datum in DFM.

- 12 a. Explain in detail about the material selection process.

OR

- b. Describe the design principle for manufacturability in DFMA.

- 13 a. List out the design rules for form design of welded member with neat sketch.

OR

- b. Discuss about the doweling procedure and counter sunk screws.

- 14 a. List out the design rules for form design of forging member with neat sketch.

(p.t.o)

OR

b. Summarize about minimizing the core requirements in casting process with example.

15 a. Describe in detail about the design for economy.

OR

b. Describe in detail about design features to facilitate machining, drills and milling cutters.

16 a. Explain the concept of self automation.

OR

b. Explain the design guidelines for robotic assembly.

17 a. List the factors of demand and supply and explain it.

OR

b. Write a short note on redesign of components for casting.

18 a. Briefly explain about the rules and requirement in forging consideration.

OR

b. Explain in detail about inspection method in GT.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Develop the possible solution for material selection in form design.

OR

b. Compare and contrast the economical consideration between casting and forging process

20 a. Explain briefly Computer modelling of casting processes.

OR

b. Explain the various factors that determines the choice of material

SL.NO:1064

SUBJECT CODE:17MESE07

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB -2022
MECHANICAL ENGINEERING

ELECTIVE - NUCLEAR POWER ENGINEERING

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Define fusion.
- 2 Mention the use of coolants in Moderators?
- 3 Define the chemical properties of Zirconium
- 4 How long does the spent nuclear fuel remain radioactive?
- 5 Define mixer
- 6 Mention the important reducing agents.
- 7 Define defense nuclear waste.
- 8 How do you dispose the nuclear waste?
- 9 List the types Radioactive wastes.
- 10 Describe about the heavy water.

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Analyze how to balance Redox reactions using Ion exchange method.

OR

b.

List out the materials need to prepare the control rods? Explain it's properties also

- 12 a. Discuss the world thorium resources What are the possibilities is there for replacing uranium to thorium

OR

b. Draw a small mixer settlers and explain the working principle of settlers.

- 13 a. Draw a neat sketch and explain the centrifuge separation.

OR

b. Draw with neat sketch and explain the electro refining of Plutonium

(p.t.o)

14 a. Explain in detail the liquid waste disposal

OR

b. Discuss the safety measures at nuclear power plants

15 a. Discuss the geological formations of nuclear wastes

OR

b. Illustrate radioactive decay ? Explain in detail

16 a. Draw a neat diagram of nuclear reactor and explain the components of reactors

OR

b. Explain in detail how the cladding materials prevent the fuel from corrosion

17 a. Compare the properties of stainless steel and Zirconium for use the reactor fuel element cladding

OR

b. Draw a line diagram of Aqueous Head processing? Explain in detail.

18 a. List out the industrial applications of isotopes.

OR

b. Explain with neat sketch the gaseous waste disposal system

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain with neat sketch of Gas cooled reactor

OR

b. List are the methods used to prepare heavy water? Explain it's economic considerations

20 a. Explain the of Isotope separation for the following method

(a) (a)Liquid thermal diffusion

(b) (b)Gaseous diffusion

OR

b. Discuss with the help of diagrams, the methods used for treating the medium and high Radioactive wastes

SL.NO:1027

SUBJECT CODE:17MEEC21

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB - 2022
MECHANICAL ENGINEERING
ELE-BIO ENERGY TECHNOLOGY

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 List the Necessary requirements to start a briquette production unit
- 2 List the types of biogas plants
- 3 Define combustion
- 4 Define the term stoichiometric combustion
- 5 Recall the applications of Pyrolysis
- 6 Recall some Most Important Alcohols Used in Biodiesel Production
- 7 Recall the types of substrates are used for ethanol production:
- 8 Define Degree of mixing
- 9 Discuss about excess air
- 10 Define Cold Starting

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Discuss the effect of biogas on engine performance
OR
b. Illustrate with sketch about fluid Bed combustion
- 12 a. Illustrate the operations in the SVO production process
OR
b. Relate Alcohol-Catalyst Mixing of Biodiesel Production Process in detail.
- 13 a. Recall the advantages of Biomass Energy
OR
b. Recall about the various possible feed stocks
- 14 a. List out the various factors that affects the combustion process.
OR
b. List the Advantages of the carbonization products

p.t.o

2

15 a. Explain about carbon neutrality

OR

b. Explain about gasification process

16 a. Describe about physio chemical process of energy conversion process

OR

b. Describe about power generation process using biogas.

17 a. Explain with sketch the fixed Bed combustion

OR

b. Explain with neat sketch of Entrained Flow Gasifier

18 a. Discuss in detail about the Carbonization products

OR

b. Describe the following (i) Bio-ethanol (ii) Vegetable Oils

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Illustrate with neat sketch about Indirect Co-firing and Parallel Combustion process and also write the advantages , challenges of co-firing .

OR

b. Interpret the General procedure for production of ethanol from Sugarcane with its applications

20 a. Discuss in detail about the construction and working of Floating drum biogas plant with its advantages and disadvantages.

OR

b. Discuss in detail about Biomass carbonization process

SL.NO:1027

SL.NO:1014

SUBJECT CODE:17MEEC24

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB - 2022
AUTOMOBILE ENGINEERING

ELECTIVE - INDUSTRIAL ROBOTICS

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Show the functions of actuators.
- 2 Where the robots are need?
- 3 List few objects can be handled by vacuum grippers.
- 4 Define the term "dynamics".
- 5 List any two position sensors.
- 6 Describe shortly about the classification of grippers.
- 7 Describe pneumatic gripper. Where it is used?
- 8 Describe rotation matrix.
- 9 Describe the "Reliability" of a sensor.
- 10 Define "Series assembly system".

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Illustrate any two types of robot control with an example.

OR

- b. A vector $v = 25i+10j+20k$, it is translated by a distance of 8 in the x direction, 5 in the y direction and 0 in the z direction. Write the translated transformation of the given vector.

- 12 a. If $a_{xyz} = (6,4,3)^T$ and $b_{xyz} = (8,4,6)^T$ are the coordinates with respect to the reference coordinate system, determine the corresponding points a_{uvw} , b_{uvw} with respect to the rotated $OUVW$ coordinate system if it has been rotated 90° about OZ axis.

OR

- b. Given $P_{xyz} = [2 \ 3 \ 4]^T$, determine P_{uvw} when $OUVW$ is rotated about Z-axis by 90°

- 13 a. Explain the sensors in Robotic Arc Welding.

OR

- b. Model the Cam actuation in the gripper.

- 14 a. Derive the inverse transformation equation of the RR robotic arm in 2D space.

p.t.o

OR

2

b. Explain the working principle of polar configuration system robots with reference to the work volume with suitable sketch.

15 a. Explain the working principle of jointed arm configuration system robots with reference to the work volume with suitable sketch.

OR

b. Discuss the working principle of a stepper motor with neat sketch.

16 a. Explain with a neat sketch the construction and working of the two fingered gripper

OR

b. Describe three fingered gripper. Where it is used? Detail its construction with a neat sketch.

17 a. Briefly explain capacitive proximity sensor with sketch.

OR

b. Explain analog sensor with neat sketch.

18 a. Discuss the problems for Robots in arc welding.

OR

b. Explain robot assembly system configurations.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Derive the reverse transformation of the 2-Degree of freedom arm.

OR

b. List the difference between forward kinematics and inverse kinematics. Explain.

20 a. Explain limited and intelligent robot control with suitable examples.

OR

b. Explain the application of Robot in assembly operation like part mating and part joining.

SL.NO:1014

SL.NO:1009

SUBJECT CODE: 17MEEC11

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB - 2022
MECHANICAL ENGINEERING

ELECTIVE- INDUSTRIAL ROBTICS

Time : Three Hours

Maximum Marks:100 Marks

Answer ALL questions
Part-A (10 x 2 =20 Marks)

- 1 Predict the few application of “End effector”.
- 2 Show the Gear and rack method of actuating in the gripper.
- 3 Define “Spatial Resolution”.
- 4 Define the term "statics".
- 5 List few transfer operations done by the robots.
- 6 Describe the “Accuracy” of a robot.
- 7 Describe the screw actuation in the gripper.
- 8 Classify the links. Show any one link with help of neat diagram.
- 9 Expand RCC. State its applications.
- 10 Discuss the two approaches used with vision sensors for arc welding.

Answer Any FIVE questions
Part-B (5 x10 =50 Marks)

- 11 a. Show the industrial robots drive systems briefly.

OR

- b. Given two points $a_{uvw} = (4,3,2)^T$ and $b_{uvw} = (6,2,4)^T$ with respect to the rotated $OUVW$ coordinate system, determine the corresponding points a_{xyz} , b_{xyz} with respect to the reference coordinate system if it has been rotated 60° about the OZ axis.
- 12 a. Given two points $a_{uvw} = (5,4,3)^T$ and $b_{uvw} = (4,2,4)^T$ with respect to the rotated $OUVW$ coordinate system, determine the corresponding points a_{xyz} , b_{xyz} with respect to the reference coordinate system if it has been rotated 90° about the OZ axis.
- OR**
- b. Write the rotation matrix for a rotation of 30° about OZ axis, followed by a rotation of 60° about OX axis, followed by a rotation of 90° about OY axis.

- 13 a. Explain the sensors in Robotic Arc Welding.

OR

- b. Model the Cam actuation in the gripper.

p.t.o

2

14 a. Describe the types and classifications of the robot.

OR

b. Explain the working principle of polar configuration system robots with reference to the work volume with suitable sketch.

15 a. Explain the working principle of cylindrical configuration system robots with reference to the work volume with suitable sketch.

OR

b. Explain the robot anatomy.

16 a. Explain with a neat sketch the construction and working of the two fingered gripper

OR

b. Explain the linkage actuation in the gripper.

17 a. Briefly explain the triangulation sensing principle.

OR

b. Discuss about optical proximity sensor.

18 a. Briefly explain features of the welding robot.

OR

b. Explain robot assembly system configurations.

Answer ALL questions

PART-C (2 x 15 = 30)

19 a. Explain the application of Robot system in "Die Casting".

OR

b. List any two Position Sensors used in robots and explain with the help of neat sketches.

20 a. Discuss the commercially available industrial robots drive systems?

OR

b. Detail the forward and inverse kinematic solutions in robotics. Compare them with an example

SL.NO:1009

SL.NO:10005

SUBJECT CODE:17MECC06

VINAYAKA MISSIONS RESEARCH FOUNDATION
(Deemed to be University)
B.E./ B.TECH DEGREE EXAMINATIONS- FEB- 2022
MECHANICAL ENGINEERING
KINEMATICS OF MACHINES

Time : Three Hours

Maximum Marks:100 Marks

Answer **ALL** questions
Part-A (10 x 2 =20 Marks)

- 1 Discuss the rubbing velocity at pin joint.
- 2 Define is higher pair.
- 3 Define relative velocity of two bodies.
- 4 Define pitch point of a cam.
- 5 Define pressure angle of a cam mechanism and state the best value of the pressure angle.
- 6 List out the advantages of epicyclic gear train.
- 7 Define co efficient of friction.
- 8 Discuss degree of freedom for a kinematics pair.
- 9 Describe disadvantages of cam mechanisms.
- 10 Discuss axial pitch of a helical gear?

Answer **Any FIVE** questions
Part-B (5 x10 =50 Marks)

- 11 a. Two involute gear of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s. assuming addendum as standard and equal to one module, find: 1. The angle turned through by pinion when one pair of teeth is in mesh: and 2. The maximum velocity of sliding.

OR

- b. The following data relate to a pair of 20° involute gear in module=6mm, number of teeth on pinion=17, number of teeth on gear=49; Addenda on pinion and gear wheel =1 module. Find (i). The number of pair of teeth in contact, (ii).The angle turned through by the pinion and the gear wheel when one pair of teeth is in contact, and (iii).The ratio of sliding to rolling motion when the tip of a tooth on the large wheel just making contact.

p.t.o

- 12 a. A 30 kW engine develops a maximum torque of 200 N-m and is driving a car having a single plate clutch of two active surfaces. Axial pressure is not to exceed 0.95 bar. External diameter of friction plate is 1.25 times internal diameter. Assume uniform wear and coefficient of friction = 0.25. Determine dimension of friction plate and axial force exerted by the springs.

OR

- b. In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Calculate the angular velocity of link CD when angle BAD = 60°.
- 13 a. The crank and connecting rod of a theoretical steam engine are 0.5 m and 2 m long respectively. The crank makes 180 r.p.m. in the clockwise direction. When it has turned 45° from the inner dead centre position, Determine: (i). Velocity of piston, (ii). Angular velocity of connecting rod by the instantaneous centre method (i) Find the number of instantaneous centres for a six link mechanism.

OR

- b. The following data relate to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent. The minimum radius of the cam = 25 mm, Roller radius = 7.5 mm, Lift = 28 mm, Offset of follower axis = 12 mm towards right, Angle of ascent = 60°, Angle of descent = 90°, Angle of between ascent and descent = 45°, Speed of the cam = 200 r.p.m. Draw the profile of the cam and determine the maximum velocity and the uniform acceleration of the follower during the outstroke and the return stroke.
- 14 a. In a symmetrical tangent cam operating a roller follower, the least radius of the cam is 30 mm and roller radius is 17.5 mm. The angle of ascent is 75° and the total lift is 17.5 mm. The speed of the cam shaft is 600 r.p.m. Calculate: 1. the principal dimensions of the cam; 2. the accelerations of the follower at the beginning of the lift, where straight flank merges into the circular nose and at the apex of the circular nose. Assume that there is no dwell between ascent and descent offset by 10 mm to right.

OR

- b. Explain the different types of constraints with suitable sketch
- 15 a. Explain with neat sketch any two inversions of a double slider crank chain.

OR

- b. Explain the following: (i). Snap action mechanism (ii). Ratchet and escapement mechanism
- 16 a. Explain the different types of links in detail.

OR

3

- b. Describe the use of Instantaneous centre method in kinematic analysis. (ii) Crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm; crank and connecting rod are of lengths 150 mm and 600 respectively.

- 17 a. (i) Discuss the advantages of involute gear tooth profile.
(ii) Describe the advantages and applications of helical, bevel and worm gears.

OR

- b. Discuss in detail about compound and reverted gear trains.

- 18 a. Discuss the functions of clutches in automobiles.

OR

- b. Explain the uses of brakes in automobiles.

Answer ALL questions

PART-C (2 x 15 = 30)

- 19 a. (i) Analyze interference in gears and discuss the measures to eliminate the same.
(ii) An epicyclic train has a pinion A having 15 teeth, centrally located and rigidly connected to shaft of driving motor. Another gear B having 20 teeth is gearing with A and also with annular fixed wheel D. Gear C is integral with B and meshes with another annular wheel E which is keyed to the shaft of driven unit. The arm rotates about driving shaft and carries compound gear B & C. Sketch the arrangement and determine speed of machine for a motor speed of 1000 rpm. Also determine torque on machine shaft for a motor torque of 100 N-m.

OR

- b. An automotive single plate clutch consists of two pairs of contacting surfaces. The inner and outer radii of friction plates are 120 mm and 250 mm respectively. The coefficient of friction is 0.25 and the total axial force is 15KN. Calculate the power transmitting capacity of the clutch plate at 500 r.p.m. using. p.t.o
(i) Uniform wear theory and
(ii) Uniform pressure theory.

- 20 a. Sketch and describe the working of two different types of quick return mechanism. Give examples of their application. Derive an expression for the ratio of time taken in forward and return stroke for one of this mechanism. p.t.o

OR

4

- b. Draw the profile of a cam to give following motion to a flat faced reciprocating follower. (1) Follower to have a stroke of 20 mm during 120° of cam rotation. (2) Follower to dwell for 30° of cam rotation (3) Follower to return to initial position during 120° of cam rotation. (4) Follower to dwell for remaining 90° of cam rotation. The base circle radius is 40 mm and the follower axis coincides with cam axis of rotation.

SL.NO:10005