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R22

Course Code: A403305



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: **MECHANICS OF SOLIDS**

(Mechanical Engineering)

Date: 05.02.2024 AN

Time: 3 hours

Max.Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark.

10x1=10M

- | | |
|---|-----|
| 1. Define factor of safety. | 1 M |
| 2. Write the relation between Young's modulus, shear modulus and Poisson's ratio. | 1 M |
| 3. What are the types of beams? | 1 M |
| 4. Write the relation between bending moment, shear force and load. | 1 M |
| 5. Explain about Neutral axis. | 1 M |
| 6. Write the expression for section modulus of circular section. | 1 M |
| 7. What is the principal plane? and write equation for it. | 1 M |
| 8. Write equations of the center and radius of Mohr's circle. | 1 M |
| 9. Represent a shaft subjected to combined axial load, torsion and bending. | 1 M |
| 10. Differentiate columns and struts. | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). i) Define the following i) Poisson's ratio ii) shear modulus iii) Volumetric strain. 3M
 ii) A steel rod is 2.2 m long and must not stretch more than 1.2 mm when a 8.5kN load is applied to it. Knowing that $E = 200\text{GPa}$, determine (i) the smallest diameter rod that should be used, (ii) the corresponding normal stress caused by the load. 7M

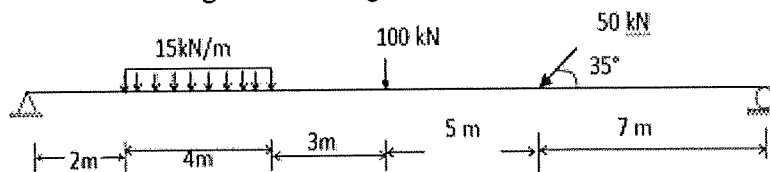
OR

11. B). i) Define proportionality limit, elasticity limit, yield stress and ultimate stress of a material showing them on stress – strain curve of mild steel? 4M
 ii) A circular rod of steel 14mm diameter is tested in a testing machine and it is found that when the tension is 18kN the total extension on a 21cm length is 0.15mm. Find the value of E. 6M

12. A). Draw the shear force and bending moment diagram for a simply supported beam of span 9m. The beam carries a UDL of 10KN/m for a distance of 6m from the left support. Find the maximum value and their position. Give the values at important points in the diagram. 10M

OR

12. B). Draw shear force and bending moment diagrams for the beam shown in Figure below: 10M



(P.T.O..)

13. A). A beam of rectangular cross section 200mm deep and 100mm wide is subjected to a pure sagging bending moment of 500kN.m. Determine the maximum bending stress in the beam. If the value of modulus of elasticity for the beam materials 200kN/mm^2 , find the radius of curvature of that portion of the beam. Also calculate the value of bending stress at 25mm below the top surface of the beam 10M

OR

13. B). A beam of triangular cross-section with base b and height h , is used with the base horizontal. Calculate the intensity of max shear stress and plot the variation on shear stress intensity over the section. 10M

14. A). List the theories of failure for ductile materials and explain, in detail, about Shear Strain Energy Theory (Von-Mise's theory) of failure. 10M

OR

14. B). The principal stresses at a point across two perpendicular planes are 100 N/mm^2 and 50 N/mm^2 . Find the normal and tangential stresses and the resultant stress and its obliquity on a plane at 30° with the major principal plane. Solve by analytical method or Mohr circle method. 10M

15. A). Derive the torsion equation $s T/J = \tau/R = G\theta/L$. 10M

OR

15. B). A solid round bar 6 cm in diameter and 2.5 m long is used as a strut. One end of the strut is fixed while its other end is hinged. Find the safe compressive load for this strut using Euler's formula. Assume $E = 200\text{ GPa}$ and factor of safety = 3. 10M

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R22

Course Code: A403303



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: METALLURGY & MATERIAL SCIENCE
(Mechanical Engineering)

Date: 07.02.2024 AN

Time: 3 hours

Max.Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark.

10x1=10M

1. Define Point defect. 1 M
2. Define Crystallographic planes. 1 M
3. What is the significance of phase rule? 1 M
4. What do you mean by eutectic reaction? 1 M
5. Define heat treatment. 1 M
6. What is quenching? 1 M
7. Define martempering. 1 M
8. Define hardness and hardenability. 1 M
9. What are tool steels? 1 M
10. Name at least four important copper base alloys. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Define a unit cell. Explain about BCC and FCC structure. 10M
- OR**
- 11.B). How do volume defects such as inclusions affect the optical properties of materials? 10M
- 12.A). What are the various types of solid solutions? Explain with examples 10M
- OR**
- 12.B). Draw the Eutectoid system diagram and label all points, lines and areas. Explain its important features. 10M
- 13.A). Name the various methods of heat treatment of steel. Briefly explain any two method. 10M
- OR**
- 13.B). Explain the need of tempering in hardened steel. Describe the process of tempering 10M
- 14.A). Draw a diagram of critical cooling rate on TTT diagram and briefly explain it. 10M
- OR**
- 14.B). With sketches describe the following heat treatment processes: 10M
 - i) Austempering process.
 - ii) Martempering process.
- 15.A). Explain the structure and properties of white cast iron. 10M
- OR**
- 15.B). What are the notable properties of Copper and its alloys? and Draw copper-zinc equilibrium diagram explain it 10M

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Course Code: A403304



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: THERMODYNAMICS

(Mechanical Engineering)

Date: 09.02.2024 AN

Time: 3 hours

Max.Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark.

10x1=10M

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|-----|---|-----|
| 1. | What is the difference between macroscopic viewpoint and microscopic viewpoint? | 1 M |
| 2. | What is mean by point and path function. | 1 M |
| 3. | State first law of thermodynamics. | 1 M |
| 4. | Define availability and irreversibility. | 1 M |
| 5. | What is statement of Clausius inequality? | 1 M |
| 6. | What is mean by heat transfer and work transfer? | 1 M |
| 7. | Define mole fraction and mass fraction. | 1 M |
| 8. | Define relative humidity. | 1 M |
| 9. | Draw the P-V diagram of Lenoir cycle. | 1 M |
| 10. | What are processes of Bell-coleman cycle. | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). What is a thermodynamic system? Explain different types of systems with suitable examples. 10M

OR

11. B). i) Explain zeroth law of thermodynamics. 5M
ii) What is meant by thermodynamic equilibrium? Explain. 5M
12. A). i) Explain the concept of PMM-I. 5M
ii) In an internal combustion engine, during the compression stroke the heat rejected to the cooling water is 50kJ/kg and the work input is 100kJ/kg. Calculate the change in internal energy of the working fluid stating whether it is a gain or loss. 5M

OR

12. B). i) What are the limitations of the First law of Thermodynamics? 5M
ii) Derive the equations of Maxwell relations. 5M
13. A). i) Derive the clausius-clapeyron equations. 5M
ii) Explain different thermodynamic processes involved in conversation of ice at -15°C to steam at 200°C with help of mollier chart. 5M

OR

13. B). A certain gas has $c_p = 1.968$ kJ/kg K, and $c_v = 1.507$ kJ/kg K. Find its molecular weight and gas constant. A constant volume chamber of 0.3m^3 capacity contains 2kg of this gas at 5°C. Heat is transferred to the gas until the temperature is 100°C. Find the work done, heat transferred and the changes in internal energy, enthalpy and entropy. 10M

(P.T.O.)

14. A). A gas mixture contains 1 Kg of O_2 and 3 Kg of N_2 . The pressure and temperature of the mixture are 1 bar and $27^\circ C$. Determine: i) Mass fraction and mole fraction of each constituent ii) Average molecular weight of mixture iii) Partial Pressure of constituents iv) Specific gas constant v) Mixture volume vi) Mixture density. 10M

OR

14. B). i) What are the psychrometric properties? Explain them. 5M
ii) Air at $20^\circ C$, 40% RH is mixed adiabatically with air at $40^\circ C$, 40% RH in the ratio of 1 kg of former with 2 kg of the latter (on dry basis). Find the final condition of air. 5M

15. A). i) Differentiate between Otto cycle, diesel cycle and dual combustion. 5M
ii) An engine of 250 mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.00263 m^3 . The initial pressure and temperature are 1 bar and $50^\circ C$. If the maximum pressure is limited to 25 bar, Calculate the air standard efficiency of the cycle and the mean effective pressure for the cycle. 5M

OR

15. B). Explain the vapour compression refrigeration cycle with neat sketch and derive the COP of the cycle with P-V and T-S diagrams. 10M

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R22

Course Code: A401201



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: **FLUID MECHANICS & HYDRAULIC MACHINERY**
(Mechanical Engineering)

Date: 12.02.2024 AN

Time: 3 hours

Max.Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark.

10x1=10M

- | | | |
|-----|--|-----|
| 1. | What is the effect of temperature on viscosity of water and that of air? | 1 M |
| 2. | Convert the reading on pressure gauge: - 30 mm of Hg into kPa. | 1 M |
| 3. | What is meant by surface and body forces? | 1 M |
| 4. | What are the practical applications of Bernoulli's equation? | 1 M |
| 5. | State the significance of drag and lift forces. | 1 M |
| 6. | What are the factors influencing the frictional loss in pipe flow? | 1 M |
| 7. | Mention the causes of cavitation in Francis turbine. | 1 M |
| 8. | How governing of speed is done on Pelton wheel? | 1 M |
| 9. | What is priming of a centrifugal pump? | 1 M |
| 10. | Define negative slip of a reciprocating pump. | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). i) Derive the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure. 5M
- ii) An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. The diameter of shaft is 0.5 m and it rotates at 200 rpm. Calculate the power lost in the oil for a sleeve length of 100 mm. The thickness of the oil film is 1.0 mm. 5M

OR

11. B). i) Explain U-tube differential manometer with a neat sketch. 5M
- ii) Calculate the specific weight and density of one liter of a liquid which weights 10 N. 5M
12. A). i) Obtain an expression for continuity equation for three - dimensional flow. 5M
- ii) Given that $u = xy$, $v = 2yz$, examine whether these velocity components represent two or three dimensional incompressible flow. If three dimensional, determine the third component. 5M

OR

12. B). i) What is Euler's equation of motion? How will you derive Bernoulli's equation from it. 5M
- ii) Water is flowing through a pipe has diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm² and the pressure at the upper end is 9.81 N/cm². Determine the difference in datum head if the rate of flow through pipe is 40 lit/s. 5M

(P.T.O.)

13. A). i) Explain Reynold's experiment with a neat sketch. 5M
ii) An orificemeter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. 5M
The pressure gauges fitted upstream and downstream of 19.62 N/cm² and 9.81 N/cm² respectively, co-efficient of discharge for the meter is given as 0.6. Find the discharge of water through pipe.

OR

13. B). i) Discuss the phenomenon of separation of boundary layer 5M
ii) Derive the expression for head loss in pipes due to friction by using Darcy-Weisbach equation. 5M

14. A). i) What is specific speed? State its significance in the study of hydraulic machines. 5M
ii) A Nozzle of 50 mm diameter delivers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet at 5 m/s. Find the force on the plate, the work done and the efficiency of jet. 5M

OR

14. B). i) Explain in detail the significance of characteristics curves in turbine. 5M
ii) A Pelton wheel is working under a head of 50 m and the rate of flow of water through the jet is 900 Lit/s. Find the efficiency and power produced by the Pelton wheel if the jet is deflected by the bucket through an angle of 165°. Take $C_v = 0.98$. 5M

15. A). i) Derive an expression for specific speed of a centrifugal pump. 5M
ii) A centrifugal pump delivers water against a net head of 14.5 m and a design speed of 1000 r.p.m. The vanes of curved back to an angle of 30° with the periphery. The impeller diameter is 300 mm and outlet width is 50 mm. Determine the discharge of the pump if manometric efficiency is 95 %. 5M

OR

15. B). i) Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water. 5M
ii) Explain the functions of air vessels in a reciprocating pump. 5M

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R22

Course Code: A402204



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech III Semester Regular Examinations February-2024

Course Name: **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**
(Common for CE & ME)

Date: 14.02.2024 AN

Time: 3 hours

Max.Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries ONE mark.

10x1=10M

1. Define RMS and Average values of sine waveform. 1 M
2. Classify the electrical sources. 1 M
3. Define Earthing. 1 M
4. What is the Power Factor? 1 M
5. Draw the equivalent circuit of 1-phase transformer. 1 M
6. What is the function of DC Generator? 1 M
7. Draw the i-v characteristics of PN junction diode. 1 M
8. Compare full wave and half wave rectifier. 1 M
9. Name the terminals of BJT. 1 M
10. Draw the connection diagram of FET. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Explain the terms (i) real power (ii) reactive power (iii) apparent power and also discuss the voltage and current relations in star and delta connections. 10M
- OR**
11. B). State and explain the KCL and KVL with suitable example. 10M
12. A). Explain the construction and working principle of MCB 10M
- OR**
12. B). Write short notes on cables and earthing. 10M
13. A). Explain the principle of operation of Induction Motor. 10M
- OR**
13. B). Analyse the construction and principle of operation of Synchronous generator. 10M
14. A). Explain the principle of operation of PN junction diode in both modes. 10M
- OR**
14. B). Write short notes on different types of filters. 10M
15. A). Explain the construction and working principle of BJT. 10M
- OR**
15. B). Compare CE, CB and CC configurations. 10M
