

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(UGC AUTONOMOUS)

Examination : B.Tech III Sem Regular & Supplementary Examinations December-2024  
 Course Name : Mechanics of Solids  
 Course Code : A403305  
 Branch : Mechanical Engineering  
 Date & Session : 19-12-2024 AN                      Duration: 3 hours                      Max. Marks: 60

(Note: Assume suitable data if necessary)

**PART-A**

Answer all TEN questions  
Each question carries ONE mark.

10x1=10M

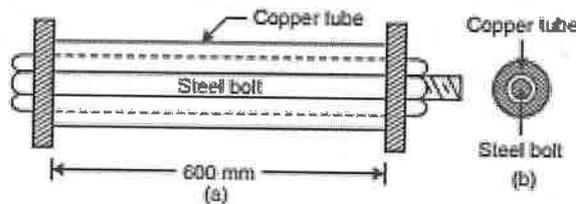
1. Define Poisson's Ratio. 1 M
2. Define the resilience and Modulus of resilience. 1 M
3. Classify the types of supports. 1 M
4. Discuss point of contraflexure. 1 M
5. State the assumptions in theory of simple bending. 1 M
6. Write the formula for shear stress in beam. 1 M
7. State maximum principal strain theory. 1 M
8. Explain the concept of Mohr's circle. 1 M
9. A mild steel shaft 120 mm diameter is subjected to a maximum torque of 20 kN-m and a maximum bending moment of 12 kN-m at a particular section. Find maximum Shear stress generated in the shaft. 1 M
10. What is the difference between Strut and column? 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

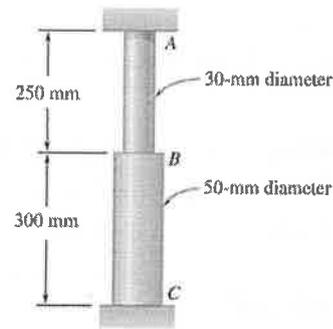
- 11.A). A steel bolt of 20 mm diameter passes centrally through a copper tube of internal diameter 28 mm and external diameter 40 mm. The length of whole assembly is 600 mm. After tightfitting of the assembly, the nut is over tightened by quarter of a turn. What are the stresses introduced in the bolt and tube, if pitch of nut is 2 mm?  
 Take  $E_s = 2 \times 10^5$  MPa and  $E_c = 1.2 \times 10^5$  MPa



(P.T.O..)

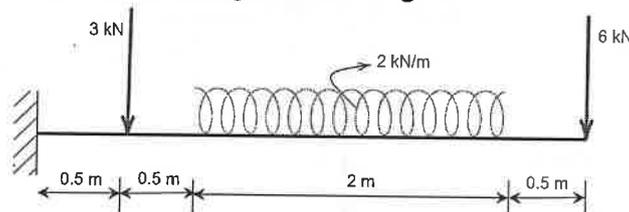
OR

11. B). A rod consisting of two cylindrical portions AB and BC is restrained at both ends. Portion AB is made of steel ( $E_s = 200 \text{ GPa}$ ,  $\alpha_s = 11.7 \times 10^{-6}/^\circ\text{C}$ ) and portion BC is made of brass ( $E_b = 105 \text{ GPa}$ ,  $\alpha_b = 20.9 \times 10^{-6}/^\circ\text{C}$ ). Knowing that the rod is initially unstressed, determine the compressive force induced in ABC. when there is a temperature rise of  $50^\circ\text{C}$ .



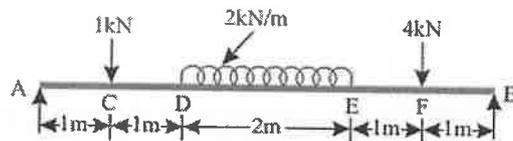
10M

12. A). Determine the expressions for Shear force and Bending moment for the cantilever beam shown. Draw Shear Force and Bending Moment diagrams. 10M



OR

12. B). Draw the Shear Force and Bending Moment diagrams for a cantilever loaded as shown in fig. Determine the maximum value of bending moment and its location. 10M



13. A). i) A rectangular beam 300 mm deep is simply supported over a span of 4m. Determine the uniformly distributed load per meter which the beam may carry, if the bending stress should not exceed  $120 \text{ N/mm}^2$ . Take  $I = 8 \times 10^6 \text{ mm}^4$ . 5M  
 ii) A beam of circular section of 150 mm diameter is subjected to a shear force of 20 kN. Calculate the value of maximum shear stress and also sketch the variation of shear stress along the depth of the beam. 5M

OR

13. B). An I beam of 200 mm depth is simply supported over an effective span of 8m. Find what maximum intensity of udl it can carry over entire length if the allowable bending stresses in tension and compression are 30 and  $45 \text{ N/mm}^2$  respectively. Take  $I_{NA} = 5935.5 \times 10^4 \text{ mm}^4$ . Distance of bottom fiber from NA is 87.38 mm. 10M

14. A). At a point in a strained material there are normal stresses of 60 MPa (tensile) and 40 MPa (compressive) at right angles to each other with a shear stress 20 MPa (positive). Determine the principal stresses, maximum shear stress and planes on which they act. Show them on the sketch of properly oriented element 10M

OR

14. B). Discuss Maximum principal stress theory and Maximum shear strain energy theory (VonMises Theory) of failures. 10M

15. A). i) Derive the expression of Torsion Equation with usual notation. State the assumptions. 5M  
 ii) A solid steel shaft has to transmit 75 kW at 200 RPM Taking allowable shear stress as  $70 \text{ MN/m}^2$ , find suitable diameter for the shaft, if the maximum torque transmitted on each revolution exceeds the mean by 30% 5M

OR

15. B). Derive Euler's formula when both ends of the column are hinged or pinned and state the assumptions. 10M

\*\*\*\*\*

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(UGC AUTONOMOUS)**

**Examination** : B.Tech III Sem Regular & Supplementary Examinations December-2024  
**Course Name** : Metallurgy & Material Science  
**Course Code** : A403303  
**Branch** : Mechanical Engineering  
**Date & Session** : 21-12-2024 AN **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

**PART-A**

**Answer all TEN questions**  
**Each question carries ONE mark.**

**10x1=10M**

1. Define unit cell. 1 M
2. What is mean by Line defects in solids 1 M
3. Define an alloy. 1 M
4. What is phase rule? 1 M
5. What is mean by annealing? 1 M
6. Define hardenability 1 M
7. What is mean by austempering treatment. 1 M
8. What do you mean by the term case-hardening? 1 M
9. What are maraging steels? 1 M
10. What are the applications of ceramics? 1 M

**PART-B**

**Answer the following. Each question carries TEN Marks.**

**5x10=50M**

- 11.A). Describe with a neat sketch of FCC and BCC crystal structure and calculate its packing factor, coordinate number 10M

**OR**

11. B). Classify in detail the different types of crystal imperfections. Explain the edge dislocation with a neat sketch. 10M

12. A). i) What is necessity of alloy? 4M  
ii) What is the Hume Rotherys rules? Discuss in detail 6M

**OR**

12. B). Construct a phase diagram and explain briefly and list out different types of phase diagrams. 10M

13. A). i) Compare the purpose of using normalizing, Annealing and Hardening? 5M  
ii) Explain the need of tempering in hardened steel. Describe the process of tempering. 5M

**OR**

13. B). Explain about the isothermal transformation diagrams for Fe-C. 10M

**(P.T.O..)**

14. A). What is continuous cooling transformation diagram? Explain the steps employed to construct continuous cooling transformation diagrams. 10M

**OR**

14. B). Explain briefly about any four surface hardening processes. 10M

15. A). Evaluate Grey cast iron structure and properties. 10M

**OR**

15. B). Explain the structure and properties of Aluminum and its alloys. 10M

\*\*\*\*\*

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(UGC AUTONOMOUS)**

**Examination** : B.Tech III Sem Regular & Supplementary Examinations December-2024  
**Course Name** : Thermodynamics  
**Course Code** : A403304  
**Branch** : Mechanical Engineering  
**Date & Session** : 24-12-2024 AN      **Duration:** 3 hours      **Max. Marks:** 60

(Note: Assume suitable data if necessary)

**PART-A**

**Answer all TEN questions**  
**Each question carries ONE mark.**

10x1=10M

1. What is an irreversible process? Give examples. 1 M
2. Define the term "Thermodynamic system". 1 M
3. What is meant by PMM1? 1 M
4. State the limitations of first law of thermodynamics? 1 M
5. Define Dryness fraction. 1 M
6. What is normal boiling point? 1 M
7. Define dry bulb and wet bulb temperatures. 1 M
8. State Dalton law of partial pressure. 1 M
9. What is Bell Coleman cycle? List out the processes involved in it. 1 M
10. Draw Otto cycle on T-s diagram. 1 M

**PART-B**

**Answer the following. Each question carries TEN Marks.**

5x10=50M

- 11.A). Explain about point function and path function? Show that heat is a path function 10M

**OR**

11. B). A cylinder Piston arrangement is containing fluid at a pressure of 3 bar and with specific volume of 0.18 m<sup>3</sup>/kg allows the fluid to expand reversibility to a pressure of 0.6 bar according to the law  $PV^2=C$  where C is constant. Determine the work done by the fluid on the piston. 10M

12. A). Two Carnot engines work in series between the source and the sink temperatures of 550 K and 350 K respectively. If both engines develop equal power, starting from basic principle determine the intermediate temperature. 10M

**OR**

12. B). Justify the statement: "Entropy of an Isolated system either increase or remain constant during process between equilibrium states" 10M

13. A). Explain various conditions of steam and explain in detail. 10M

**OR**

13. B). Two insulated tanks, A and B, are connected by a valve. Tank A has a volume of 0.70 m<sup>3</sup> and contains steam at 1.5 bar, 200°C. Tank B has a volume of 0.35 m<sup>3</sup> and contains steam at 6 bar with a quality of 90%. The valve is then opened, and the two tanks come to a uniform state. If there is no heat transfer during the process, what is the final pressure? Compute the entropy change of the universe. 10M

(P.T.O.)

14. A). Explain various Psychrometry process in detail with the help of suitable plots. 10M

**OR**

14. B). Obtain the constants for Vander Waal's equation and discuss the importance of compressibility factor charts. 10M

15. A). Compare the thermal efficiency of Otto, dual and diesel cycles on the basis of same compression ratio and same heat input? 10M

**OR**

15. B). Derive the expression of air standard efficiency of diesel cycle in standard form. 10M

\*\*\*\*\*

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**  
(UGC AUTONOMOUS)

**Examination** : B.Tech III Sem Regular & Supplementary Examinations Dec-2024/Jan-2025  
**Course Name** : Fluid Mechanics & Hydraulic Machinery  
**Course Code** : A401201  
**Branch** : Mechanical Engineering  
**Date & Session** : 07-01-2025 FN                      **Duration: 3 hours**                      **Max. Marks: 60**

(Note: Assume suitable data if necessary)

**PART-A**

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

1. What do you mean by the term Viscosity? 1 M
2. Define the terms Gauge and Vacuum pressures. 1 M
3. List out the different types of fluid flows. 1 M
4. State the Law of conservation of momentum. 1 M
5. Define the terms drag and lift forces. 1 M
6. Define the coefficient of discharge for a venturi meter. 1 M
7. What is the function of draft tube in reaction turbines? 1 M
8. Define the specific speed of turbine. 1 M
9. How the pumps are classified? 1 M
10. Define the Slip in reciprocating Pump. 1 M

**PART-B**

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). The velocity profile of a viscous fluid over a flat plate is parabolic with vertex 20cm from the plate, where the velocity is 120 cm/s. Calculate the velocity gradient and shear stress at the distance of 5 cm from the plate, given the viscosity of the fluid as 6 Poise. 10M
- OR**
11. B). An inverted differential manometer containing an oil of specific gravity 0.9 is connected to find the difference of pressures at two points of a pipe containing water. If the manometer reading is 40 cm, find the difference of pressures. 10M
12. A). Consider of fluid flowing through a horizontal pipe of diameter 30cm and 20cm at the inlet and outlet respectively with an velocity of 5m/sec at the inlet and the pressure intensity at outlet of the pipe is 30 bar. Calculate i) Pressure intensity at inlet ii) Velocity at the outlet iii) If the datum head at the inlet is 10m. Find at outlet. 10M
- OR**
12. B). A 300 mm diameter pipe carries water under a head of 20 meters with a velocity of 3.5 m/s. if the axis of the pipe turns through 45°, find the magnitude and direction of resultant force at the pipe bend. 10M
13. A). List out the various losses in a pipe flow and Explain about any two minor losses with neat sketches. 10M

(P.T.O.)

**OR**

13. B). Explain the principle of Venturi meter with a neat sketch and derive the expression for the rate of fluid flow through it. 10M
14. A). A jet of water 75 mm diameter having a velocity of 20 m/s, strike normally a flat smooth plate. Determine the thrust and work done on the plate (i) if the plate is at rest (ii) if the plate is moving in the same direction as the jet with the velocity of 5 m/s. 10M

**OR**

14. B). Explain the Working of Pelton turbine with required sketches and derive the expression for work done by the turbine. 10M
15. A). Two geometrically similar pumps are running at the same speed. One pump has an impeller diameter of 300 mm and lifts the water at the rate of 20 liters per second against a head of 15 m. Determine the head and impeller diameter of the other pump to deliver half the discharge. 10M

**OR**

15. B). Explain the Working of reciprocating pump with neat flow and indicated diagrams. 10M

\*\*\*\*\*