CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech III Semester Supplementary Examinations December-2024

Course Name: Material Engineering
(Mechanical Engineering)

Date: 17.12.2024 AN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	What do you mean by surface defects?	2 M
2.	Distinguish between Hardness and Toughness.	2 M
3.	What is fatigue strength?	2 M
4.	Draw the structure of a fatigue fracture specimen and show the various regions on it.	2 M
5.	What is Isomorphous System?	2 M
6.	What is Gibbs phase rule?	2 M
7.	What is the purpose heat treatment process?	2 M
8.	What is the Carburizing and Cyaniding?	2 M
9.	Explain the specialty of Ti alloy (Ti-6Al-4V) and list its properties and applications.	2 M
10.	What is white cast iron? What are its applications?	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	i) Explain about the effect of grain boundaries on the properties of Metals/Alloys.	6M
	ii) What is twinning? How does it differ from slip?	4M

OR

11. B).	i) Distinguish between Edge dislocation and screw dislocation.	5M
	ii) Draw and explain the importance of stress-strain curve.	5M
12. A).	What is low cycle fatigue? Explain the method to estimate the fatigue damage in metals	10M

OR

12. B).	Explain the different modes of fracture with the help of neat sketches.	10M
13. A).	i) Draw and explain the cooling curves for a) pure metal b) alloy solid solution	5M
	ii) Explain experimental methods for construction of phase diagrams	5M

OR

13. B).	i) What is the importance of phase diagrams? Explain.	3M
	ii) Construct Iron-iron carbide equilibrium diagram and label all fields with invariant Reactions	7M
14. A).	i) Differentiate between Annealing and Normalizing	5M
	ii) Distinguish between Austempering and Martempering.	5M

OR

14. B).	i) Write procedure for construction of TTT curve and with an example interpret the curve	5M
	ii) What are the different microstructures observed in TTT diagram?	5M

(P.T.O..)

15. A). What are the different types of cast iron? Discuss the manufacture of malleable C.I.   10M

OR

15. B). Write short notes on the following: 10M
    (i) Flame hardening (ii) Martensite (iii) Bainite (iv) Duralumin (v) Muntz metal

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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B.Tech III Semester Supplementary Examinations December-2024
Course Name: Thermodynamics
(Mechanical Engineering)

Date: 19.12.2024 AN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries TWO marks.   **10x2=20M**

1.	State the Zeroth law of thermodynamics. What is its significance?	2 M
2.	Outline about extensive and intensive property of system with examples.	2 M
3.	Write the expression for the first law applied to a cycle and process.	2 M
4.	Define enthalpy prove that it is a function of temperature.	2 M
5.	State and explain Clausius inequality.	2 M
6.	Define entropy.	2 M
7.	What is the difference between critical point and triple point of pure substance?	2 M
8.	Define saturation temperature. State the effect of pressure on saturation temperature.	2 M
9.	Draw the PV and Ts diagrams of Brayton cycle.	2 M
10.	What is an air standard cycle?	2 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). Define thermodynamic property, state, path, process and cycle and explain.   10M

OR

11. B). Explain the working principle of gas thermometer.   10M

12. A). i) Derive the expression for work done for an isothermal process.   4M
ii) Air at 100kPa and 290K flows steadily through a compressor at a rate of 5m/s. During the compression process the pressure and temperature of air are respectively raised to 250kPa and 400K. There is also heat loss of 15kJ/s to the cooling water. Solve for the power required to drive the compressor, Neglect changes in potential and kinetic energy.   6M

OR

12. B). i) Outline steady flow energy equation for a) boiler   b) nozzle.   5M
ii) 90kJ of heat is supplied to a system at a constant volume. The system rejects 95kJ of heat at constant pressure and 18kJ of work is done on it. The system is brought to original state by adiabatic process. Solve for the i) The adiabatic work ii) Values of internal energy at all end states if initial value is 105kJ.   5M

13. A). Derive an expression for change in entropy during i) Constant volume process ii) Constant pressure process.   10M

OR

13. B). 1 m³ of air is heated reversibly at constant pressure from 15⁰C to 300⁰C and is then cooled reversibly at constant volume back to the initial temperature. The initial pressure is 1.03 bar. Calculate the net heat flow and overall change of entropy and sketch the process on P-V diagram.   10M

(P.T.O.)

14. A). i) Define sensible heat, latent heat and super heat. 4M

ii) Calculate the enthalpy and internal energy of steam at pressure of 12bar i) when the steam is having a dryness fraction of 0.8 ii) when the steam is dry saturated. 6M

OR

14. B). i) Derive the four Maxwell's relation. 5M

ii) Write down Clapeyron equation and state its application. 5M

15. A). Explain Otto cycle with P-V and T-S diagrams and derive its efficiency. 10M

OR

15. B). A diesel engine has a clearance volume of 220cm^3 and a bore and stroke of 15cm and 20cm respectively. The inlet conditions are 100kN/m^2 and 20^{0}C. The maximum temperature of the engine is 1400^{0}C. Calculate i) ideal thermal efficiency of cycle and ii) m.e.p. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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B.Tech III Semester Supplementary Examinations December-2024

Course Name: Mechanics of Solids

(Mechanical Engineering)

Date: 21.12.2024 AN | Time: 3 hours | Max.Marks:70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks. 10x2=20M

1. Define lateral strain and volumetric strain. — 2 M
2. Draw stress–strain diagram for mild steel under tensile load. — 2 M
3. Write the assumptions in the theory of simple bending. — 2 M
4. What is the relationship between the maximum shear stress and average shear stress for a rectangle cross-section? — 2 M
5. Compare Double Integration and Macaulay's method. — 2 M
6. Write the expression for the Slope and deflection of a simply supported beam carrying point load at mid-span. — 2 M
7. Define modulus of rupture and torsional rigidity. — 2 M
8. Differentiate between proof resilience and modulus of resilience. — 2 M
9. Define compound cylinder. — 2 M
10. Write formulae for hoop stress and longitudinal stress for a thin cylinder of thickness 't' and diameter 'd'. — 2 M

PART-B
Answer the following.Each question carries TEN Marks. 5x10=50M

11.A). A steel tube of 30 mm external diameter and 20 mm internal diameter encloses a copper rod of 15 mm diameter to which it is rigidly joined at each end. If at a temperature of 10^0C there is no longitudinal stress, calculate the stresses in the rod and tube when the temperature is raised to 200^0C. After the bar is heated, an additional 100kN tensile force was applied at the ends. Find the final stresses. Take E for steel as 200 GPa and for copper as 100 GPa. $\alpha_s = 12 \times 10^{-6}/^0$C; $\alpha_c = 18 \times 10^{-6}/^0$C. — 10M

OR

11. B). At a certain point in a strained material, the principal stresses are 100MPa and 40MPa, both tensile. Find the normal, tangential and resultant stresses across a plane through the point at 50^0 to the major principal plane, using analytical or graphical methods. — 10M

12. A). The beam length 8 m length is hinged at one end and supported on rollers at a distance of 5m from the hinge. It carries a UDL of 100kN/m run over the entire span and a concentrated load of 300kN at a free end. Construct Shear Force Diagram (SFD) and Bending Moment Diagram (BMD). — 10M

OR

12. B). The Shear Force acting on a section of a beam is 100kN. The section of the beam is of a 'T' shape of dimensions 200mm x 250mm x 50mm. The flange thickness and web thickness are 50mm. The moment of Inertia about the horizontal neutral axis is 1.134×10^8mm⁴. Find the shear stress at the neutral axis and at the junction of the web and the flange. — 10M

13. A). A simply supported beam has a span of 9.0 meters. It carries a load of 72 kN at a distance   10M
of 2.0 meters and another 45 kN at a distance of 5.0 meters from the left-hand support.
Find the deflection and the slope under the loads by Macaulay's Double Integration
method. E = 200 GPa and I = 150 x 10^6 mm^4.

OR

13. B). A Simply Supported beam of span 5m subjected to uniformly distributed load (UDL) of   10M
20kN/m over its middle 3m portion. Find the maximum deflection in the beam. Take E=
200GPa and I= 10^8 mm^4.

14. A). A solid shaft is to transmit 75 kW at 200 rpm. The allowable shear stress is 70MPa. The   10M
twist in a length of 2m is not to exceed 1 degree. Find the suitable diameter for the shaft.
The modulus of rigidity of the shaft is 1x10^5MPa.

OR

14. B). Two shafts are made of the same material. Each shaft transmits the same power. The first   10M
shaft rotates at 50 rpm while the second at 5000 rpm. Determine the ratio of diameters of
the two shafts for the same maximum shear stress in each shaft.

15. A). A thin cylindrical drum 800mm in diameter and 3m long has a shell thickness of 8 mm. If   10M
the drum is subjected to an internal pressure of 3 MPa. Determine the longitudinal stress,
circumferential stress and change in volume, if Young's modulus is 200 GPa and
Poisson's ratio is 0.25.

OR

15. B). A compound cylinder is formed by shrinking one tube of 240 mm outer diameter onto   10M
another tube of 120 mm inner diameter with 200 mm as the diameter of the junction. If
the radial pressure at the junction is 12 MPa due to shrinking. Find the stresses in the two
cylinders, if the fluid is admitted into the compound cylinder with 45 MPa. Determine the
final stresses in the compound cylinder.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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B.Tech III Semester Supplementary Examinations December-2024
Course Name: Machine Drawing
(Mechanical Engineering)

Date: 24.12.2024 AN   Time: 3 hours   Max.Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer any TWO questions
Each question carries five marks.   2x5=10M

1. The figure (a) shows the isometric view of shaft support. Draw its Sectional view from the front, the view from above, and the view from the right. Assume the section planes at the centre of the part.   5M

(a)

2. Sketch the following forms of nuts, with proportions marked by choosing the appropriate dimension: (a) flanged nut, (b) cap nut.   5M

3. Draw the sectional view from the front and view from the side of a cotter joint with a sleeve used to connect two rods of 50 mm diameter each.   5M

4. Sketch any one method of strengthening cast-iron steam pipe joints to withstand higher pressures.   5M

5. Sketch the necessary views of a foot-step bearing for supporting a shaft with a diameter of 50mm. Give all important proportionate dimensions.   5M

(P.T.O.)

6.   Assemble all parts of the petrol engine connecting rod shown in Fig and draw the   50M
following views: (i) Half-sectional view from the front, and (ii) The view from above.

Details of petrol engine connecting rod

Parts list			
Part No.	Name	Matl.	Qty.
1	Rod	FS	1
2	Cap	FS	1
3	Bearing brass	GM	2
4	Bearing bush	P Bronze	1
5	Bolt	MCS	2
6	Nut	MCS	2

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