H.T No: | | | | | | | | | | | **R18** **Course Code: A30321**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Supplementary Examinations July-2025

Course Name: Materials Engineering

(Mechanical Engineering)

Date: 01.07.2025 FN **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 difference between a point defect and a line defect.	2 M
2.	Define Hooke's law.	2 M
3.	Write about brittle failure.	2 M
4.	State difference between endurance limit and fatigue limit.	2 M
5.	What is an equilibrium diagram?	2 M
6.	List different reactions in binary phase diagram.	2 M
7.	In what ways cyaniding differs from carburizing?	2 M
8.	How is annealing different from normalizing?	2 M
9.	List the properties and applications of grey cast Iron.	2 M
10.	Write a note on Titanium alloys.	2 M

PART-B

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

11.A).	Explain different crystalline defects with neat sketch.	10M
	OR	
11. B).	Define a unit cell. Determine the APF for FCC & BCC structure.	10M
12. A).	Explain in detail about Griffith theory of brittle fracture.	10M
	OR	
12. B).	Describe briefly about various theories of failures.	10M
13. A).	Explain with a phase diagram of peritectic, eutectic and peritectoid reactions.	10M
	OR	
13. B).	With a neat sketch explain the schematic representation of substitutional and interstitial solid solutions.	10M
14. A).	Draw the TTT diagram for Fe-C alloys and label the phases.	10M
	OR	
14. B).	Write a short note on (i) Carburizing (ii) Nitriding (iii) Flame hardening (iv) Cyaniding.	10M
15. A).	Classify types of steels. Discuss any one. Draw its microstructure also.	10M
	OR	
15. B).	Discuss about the structure and properties of titanium and its alloys.	10M

*****

H.T No: | | | | | | | | | | | **R18** **Course Code: A30323**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Supplementary Examinations July-2025

Course Name: Thermodynamics

(Mechanical Engineering)

Date: 03.07.2025 FN **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.	Distinguish between microscopic and macroscopic approach of Thermodynamics	2 M
2.	Define thermodynamic system. What are the types of systems?	2 M
3.	State non flow energy equation and steady flow energy equation.	2 M
4.	Why work transfer is considered as path function?	2 M
5.	What are the limitations of first law of thermodynamics?	2 M
6.	State the kelvin Planck statement of Second law of thermodynamics.	2 M
7.	Define triple point of pure substance.	2 M
8.	Write Maxwell relations.	2 M
9.	What are the assumptions made in air standard cycle?	2 M
10.	Differentiate between air standard diesel and dual cycle.	2 M

PART-B

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

11.A).	Explain with the help of sketch constant volume gas thermometer.	10M
	OR	
11. B).	Explain the similarities and dissimilarities between heat and work interactions. Define internal energy.	10M
12. A).	Derive energy equation for a closed system undergoing polytropic process. What is a PMM-1?	10M
	OR	
12. B).	Air flows steadily at the rate of 0.2 kg/s through an air compressor, entering at 6m/s with a pressure of 1.0 bar and a specific volume of $0.9m^3$ /kg and leaving at 4.8m/s with a pressure of 8.9 bar and specific volume of 0.09 m^3 /kg. The internal energy of air leaving is 67kJ/Kg greater than that of the air entering. Cooling water in a jacket surrounding the air absorbs heat from the air at the rate of 100W. Calculate the power required to drive the compressor.	10M
13. A).	Show the equivalence between the Kelvin-Planck and Clausius statements of the Second Law of Thermodynamics.	10M
	OR	
13. B).	1.5 Kg of air at 1bar, 300K is contained in a rigid insulated tank. During the process 18kJ of work is done on the gas. Determine the final temperature, final pressure of air in the tank and change in entropy.	10M

(P.T.O.)

14. A). Define pure substance. Describe the phase-change process of water using a T-V diagram 10M

OR

14. B). 2kg of steam initially at a pressure of 12bar and a temperature of 250^0C expands polytropically to 1.2 bar. Estimate using steam tables i) the final condition ii) work done iii) heat transfer iv) Change in entropy. Assume the index of expansion as 1.25. 10M

15. A). Describe Otto cycle with the help of pV and T-s diagrams. Derive an expression for its air standard efficiency. 10M

OR

15. B). A mass of 1kg of air is taken through a Diesel cycle. Initially the air is at 15°C. and 1 bar. The compression ratio is 15, and the heat added is 1850kJ. Calculate the ideal cycle efficiency and mean effective pressure. Assume R=0.287kJ/kg-K, C_p= 1.005kJ/kg-K and γ=1.4. 10M

*****

H.T No: | | | | | | | | | | | **R18** **Course Code: A30181**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Supplementary Examinations July-2025

Course Name: Mechanics of Solids

(Mechanical Engineering)

Date: 05.07.2025 FN **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. Sketch stress strain curve for the mild steel and recall its significance. 2 M
2. Define proof resilience. 2 M
3. List the advantages of shear force and bending moment diagrams for beams. 2 M
4. Classify the beams. 2 M
5. Rewrite the relationship between curvature, slope and deflection of beams. 2 M
6. A beam of uniform rectangular section 200mm wide and 300mm deep is simply supported at its ends. It carries a uniformly distributed load of 9 kN/m run over the entire span of 5m. if the value of E for the beam material is 1×10^4 N/mm^2. Estimate the maximum deflection. 2 M
7. Recall the assumptions made in the derivation of shear stress produced in a circular shaft subjected to torsion. 2 M
8. Define torsional rigidity. 2 M
9. Differentiate thin cylinders and thick cylinders. 2 M
10. Define hoop stress. 2 M

PART-B

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

11.A). A tensile test was conducted on a mild steel bar. The following data was obtained from the test: (i). diameter of steel bar = 3cm, (ii) gauge length of the bar = 20cm, (iii) load at elastic limit = 250 kN, (iv) extension at a load of 150 kN = 0.21mm, (v) maximum load = 380 kN, (vi) total extension = 60mm and (vii) diameter of the rod at failure = 2.25 cm. Determine: (a) the Young's modulus, (b) the stress at the elastic limit (c) the percentage of elongation and (d) the percentage decrease in area. 10M

OR

11. B). Calculate the modulus of rigidity and bulk modulus of a cylinder bar of diameter 30 mm and of length 1.5m if the longitudinal strain in a bar during a tensile stress is four times the lateral strain. Find the change in volume, when the bar is subjected to a hydrostatic pressure of 100 N/mm^2. Take $E = 1 \times 10^5$ N/mm^2. 10M

12. A). A beam of length 6m is simply supported at the ends and carries a uniformly distributed load of 1.5 kN/m run and three concentrated loads of 1 kN, 2 kN and 3 kN acting at a distance of 1.5m, 3m and4.5m respectively from left end. Draw the shear force and bending moment diagrams and determine the maximum bending moment. 10M

OR

12. B). A continuous beam ABCD, 12 m long supported over spans AB=BC =CD= 4 m, carries a uniformly distributed load of 3 tonnes/metre run over span AB, a concentrated load of 4 tonnes at a distance of l m from point B on support BC and a load of 3 tonnes at the centre of the span CD. Determine support moments and draw the B.M. diagram for the continuous beam. 10M

(P.T.O.)

13. A). A beam ABC of length 9m has one support of the left end (Point A) and the other support at a distance of 6m from the left end (Point B). The beam carries a point load of 12 kN at right end (at point C) and also carries a uniformly distributed load of 4 kN/m between the supports. Determine the slope and deflection at C. 10M

OR

13. B). A simply supported beam of span 'L' is carrying a concentrated load W/2 at the centre and a uniformly distributed load of intensity of W per unit length. Show that Maxwell's reciprocal theorem holds good at centre of the beam. 10M

14. A). A solid shaft of mild steel 200mm in diameter is to be replaced by hollow shaft of alloy steel for which the allowable shear stress is 22 percent greater. If the power to be transmitted is to be increased by 20 percent and the speed of rotation in increased by 6 percent determine the maximum internal diameter of the hollow shaft. The external diameter of the hollow shaft is to be 200mm 10M

OR

14. B). A close-coiled helical spring has mean dimater of 75mm and spring constant of 80 kN/m. It has 8 coils, what is the suitable diameter of the spring wire if maximum shear stress is not exceed 250 MN/m^2? Modulus of rigidity of the spring wire material is 80 GN/m^2. What is the maximum axial load the spring can carry. 10M

15. A). Explain axial and hoop stress in cylinders subjected to internal pressure with neat sketches. 10M

OR

15. B). A cylindrical vessel whose ends are closed by means of rigid flange plates is made of steel plate 3mm thick. The internal length and diameter of vessel are 50 cm and 25 cm respectively. Determine the longitudinal and circumferential stresses in the cylinder due to an internal fluid pressure of 3 MN/m^2. Also calculate increase in the length, diameter and volume of the vessel. Take E = 200 GN/m^2 and poisson's ratio is 0.3. 10M

*****

H.T No: | | | | | | | | | | | **R18** | **Course Code: A30324**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech III Semester Supplementary Examinations July-2025

Course Name: Machine Drawing

(Mechanical Engineering)

Date: 08.07.2025 FN **Time: 3 hours** **Max.Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer TWO questions

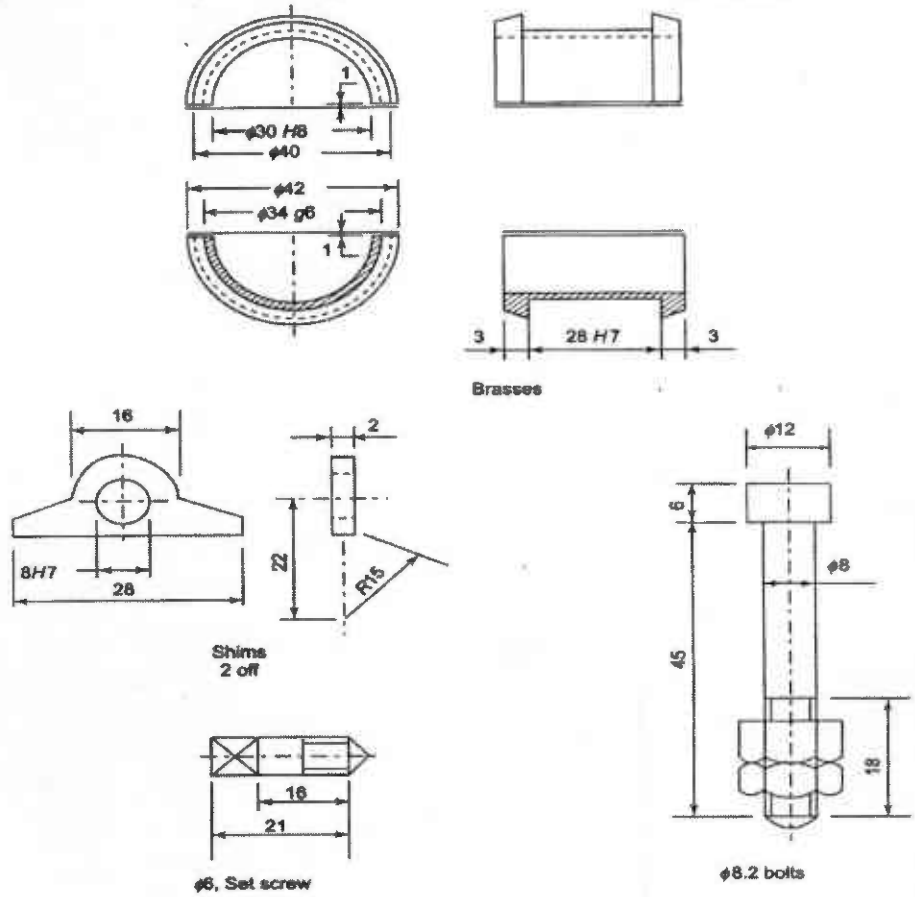
Each question carries FIVE marks. **2x5=10M**

1. Draw the three views of a hexagonal headed bolt of nominal diameter 25 mm and length 100 mm; with a hexagonal nut and washer. 5 M
2. Draw the top view and sectional front view of a double platted, double riveted zig zag rivet joint. Consider thickness of plates as 15 mm. 5 M
3. Draw the sectional front, top and side view of a socket and spigot cotter joint to join two pipes of diameter 35mm each 5 M
4. Draw half sectional front view, view from the side, left half in section, of a Flange coupling, indicating proportions to connect two shafts, each of diameter 40 mm. 5 M
5. Draw (*a*) half sectional view from the front, with left half in section and (*b*) view from above of a footstep bearing, suitable for supporting a shaft of diameter 20 mm. 5 M

PART-B

Answer the following question. Question carry FIFTY marks. **1x50=50M**

6. Assemble all the parts and draw the following views of the connecting rod. 50M
   i) Full sectional top view ii) Front view. All dimensions are in mm



*****