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October 2015

Time – Three hours
(Maximum Marks: 75)

[N.B: (1) Answer any fifteen questions in PART – A and division (A) or division (B) of each question in PART - B.

(2) Each question carries 1 (one) mark in PART – A and 12 (twelve) marks in PART - B.]

PART – A

1. Define the term shear stress.
2. State the expression for lateral strain.
3. Write the formula for deformation of prismatic bar due to self weight.
4. Define the term modular ratio.
5. Sketch a hinged support and show the reaction component.
6. State any one static equilibrium equation.
7. Define the term bending moment.
8. What is the significance of point of contra flexure?
9. Define the term centroid.
10. Sketch a typical triangular section and mark its centroidal position.
11. Write the equation of perpendicular axes theorem.
12. Write the expression for section modulus of a rectangular section.
13. State any one assumption made in the theory of simple bending.
14. Sketch a typical bending stress distribution diagram of a rectangular section.
15. Define the term torque.
16. Write the equation for stiffness of shafts.
17. Give any two examples of determinate frames.
18. Sketch a typical redundant frame.
19. How do you represent tensile and compressive forces in the member of frames?
20. State any one advantage of graphic statics.

[Turn over.....

PART - B

			Marks
21.	(A)	A steel bar 15mm wide, 10mm thick and 4m long carries a pull of 120kN. Calculate the final dimensions and change in volume of the bar. Take $E=2.10\times10^5 N/mm^2$ and $\upsilon=0.30$.	12
		(Or)	
	(B)	(i) Draw the stress-strain curve of a ductile material and mark the salient points.	4
		(ii) A bar of steel is 500mm long. Two ends are respectively 32mm and 28mm in diameter and each is 125mm long, the middle portion being 25mm diameter for the remaining length. Find the total elongation of the bar if it carries an axial pull of 30kN. Also, find the maximum and minimum stresses induced in the bar. Take $E=2\times10^5$ N/mm^2.	8
22.	(A)	(i) Define statically determinate and indeterminate beams. Give examples.	4
		(ii) A cantilever beam of span 4m carries an udl of 5kN/m throughout the span. Calculate the shear force and bending moment at every 1m and find the support reaction. Draw the SFD and BMD.	8
		(Or)	
	(B)	A simply supported beam of span 5m carries an udl of 20kN/m for a length of 2m from the left support and a point load of 10kN at 2m from the right support. Determine the maximum BM in the beam. Draw the SFD and BMD.	12
23.	(A)	(i) Define the following: Moment of inertia, polar moment of inertia and radius of gyration.	3
		(ii) A T-section has a flange width of 150mm and thickness of 20mm. The overall depth of the section is 120mm and thickness of web is 20mm. Locate the position of centroid (C.G) and determine moment of inertia about XX axis.	9
		(Or)	
	(B)	A steel beam of an I-section has following details: Top flange = 144mm x 24mm Bottom flange = 288mm x 24mm Web = 192mm x 12mm Determine the moment of inertia about XX and YY axes.	12

025

Marks

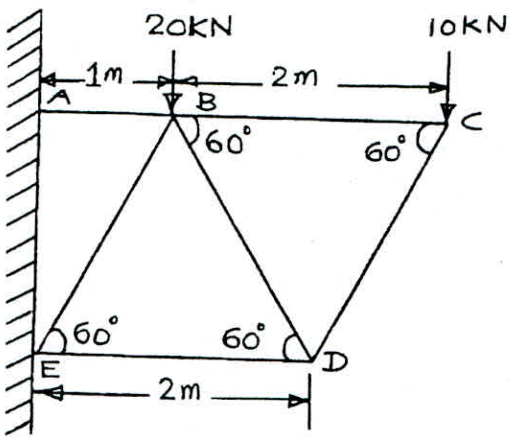
24. (A) (i) State the assumptions made in the theory of simple bending. 4

(ii) A cantilever beam of rectangular section 200mmx300mm is 3m long. It is loaded with an udl of 10kN/m over the entire span. It also carries a point load of 20kN at free end. Determine the maximum bending stress in the beam and bending stress at 50mm above the neutral axis. 8

(Or)

(B) A solid shaft transmits a torque of 50kNm. If the angle of twist is limited to 1.5° in 2m length of the shaft and the shear stress to 80N/mm², determine the diameter of the shaft. Take $G=8x10^4 N/mm^2$. 12

25. (A) Determine the magnitude and nature of forces in the member of tress shown in figure by method of joints. 12



(Or)

(B) Determine the magnitude and nature of forces in the members of truss shown in figure by graphical method. Tabulate the results. 12