[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B:
1. Question No.1 is **compulsory**. Attempt **any three** out of remaining five questions.
2. Assume suitable data wherever necessary but justify the same.
3. Figures to the right indicate full marks
4. Illustrate your answers with neat sketches wherever necessary

Q.1

(a)	Explain the difference symmetrical bending & unsymmetrical bending of beams. Give suitable examples.	5
(b)	Define shear centre and explain the necessity to determine the same.	5
(c)	State various theories of material failure. Explain any one of them.	5
(d)	Write the assumptions made in Winkler-Bach theory as applied in the analysis of curved bars.	5
Q.2	(a) Figure shows the cross-section of a T-beam, whose span is 4 m and it is subjected to udl of 10 KN/m over the entire span. Locate the position of neutral axis and draw the bending stress distribution diagram.	10

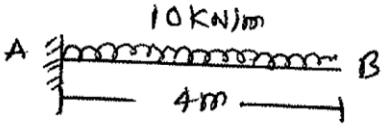
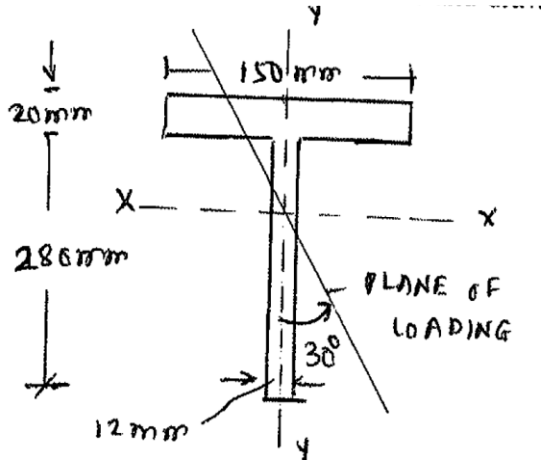


FIG Q. 2(a)



TURN OVER

Q.2 (b) Locate the shear centre for a thin walled section shown in figure. 10

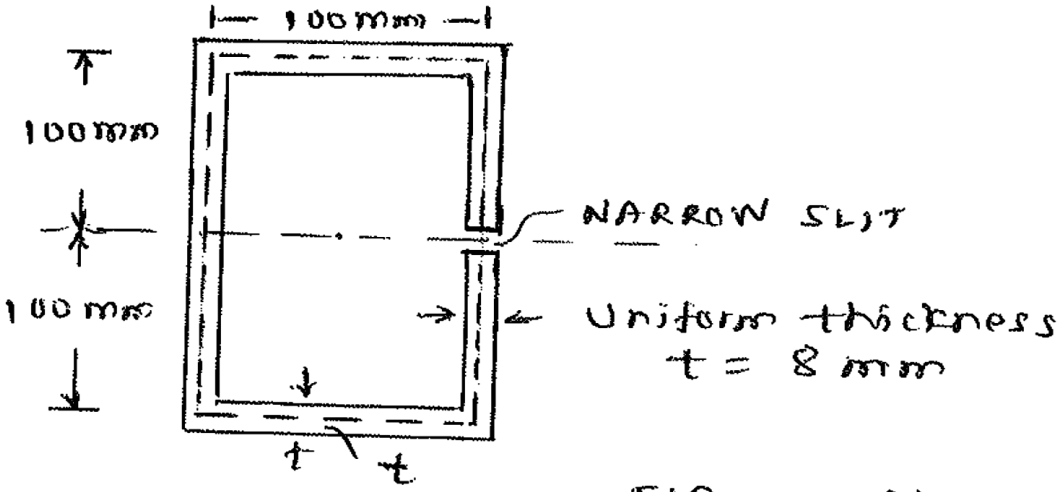


FIG. Q. 2 (b)

Q.3 A circular shaft is subjected to a maximum torque of 18 KNm and a maximum bending moment of 10 KNm at a particular section. Determine the suitable diameter of the shaft using following theories- 20

i. Maximum Shear Stress Theory
ii. Strain Energy Theory
iii. Distortion Energy Theory

Take Poisson's ratio to be 0.25 and σ_y = 250 MPa.

Q.4 (a) An overhanging beam having simply supported portion AB = 3 m and overhang part BC = 1.5 m is subjected to udl of 200 KN/m over the length AB and a clockwise moment of 80 KNm at free end 'C'. If the beam cross section is a symmetrical I section having each flange of size 400 mm x 20 mm, web thickness 10 mm and the overall depth 2000 mm, find the ratio of deflection due to shear and bending at the free end. Take E = 2.5 G. 12

(b) Derive the differential equation for the deflection curve for a beam of infinite length supported on an elastic foundation. 8

Q.5 A long steel pipe of 165 mm outer diameter is supported from a series of spring hangers each having a spring constant of 18 KN / mm. The springs are spaced at 4 m centre to centre along the pipe. The second moment of area of pipe cross section is 118 x 10^5 mm ^{4}. Compute the maximum deflection & the bending stress in the pipe if a concentrated load **1.5** KN is suspended from the mid length point of the pipe. Take E = 210 KN/mm^2. 20

Q.6 (a)A cantilever beam AB curved in the horizontal plane in the form of quadrant of a circle of radius 'R'. It is subjected to vertical udl of intensity 'w' over the entire curved length AB. Draw SFD, BMD and twisting moment diagram (TMD) indicating the salient values. 12

TURN OVER

Q.6 (b) A crane hook curved to an internal diameter of 150 mm supports a load of 175 KN. The cross section of hook is a trapezium having width 135 mm & 45 mm on concave & convex side respectively. If the distance between two sides is 180 mm, find extreme fibre stresses in the hook. Also draw the stress distribution diagram. 8

……THE END……