

longitudinal plane and the line of action of the load passes through the centroid of the rectangular section of the beam. Determine the stresses at all the corners of the section. 10

(Compulsory Question)

9. (i) Define thin cylinders. Name the stresses set up in a thin cylinder subjected to internal fluid pressure.
- (ii) What do you mean by Lamé's equations ?
- (iii) What is the importance of wire winding of thin cylinders ?
- (iv) What do you mean by a thick compound cylinder ?
- (v) What do you mean by a disc of uniform strength ?
- (vi) What is meant by crippling or buckling load ?
- (vii) What assumptions are made in the analysis of struts and columns by Euler's buckling theory ?
- (viii) What is a flat spiral spring ?
- (ix) State the assumptions for determining the stresses in the bending of curved bars.
- (x) What is shear centre ? $10 \times 2 = 20$

July-22-00254

B. Tech. EXAMINATION, 2022

Semester IV (CBCS)

STRENGTH OF MATERIALS-II (ME, AE)

ME-402

Time : 3 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Section A, B, C and D. Q. No. 9 is compulsory. Use of non-programmable calculator is allowed. Assume missing data suitably if any and specify the same.

Section A

1. A seamless spherical shell is of 0.8 m internal diameter and 4 mm thickness. It is filled with fluid

under pressure until its volume increases by 50 cubic centimetres. Determine the fluid pressure taking $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.3. 10

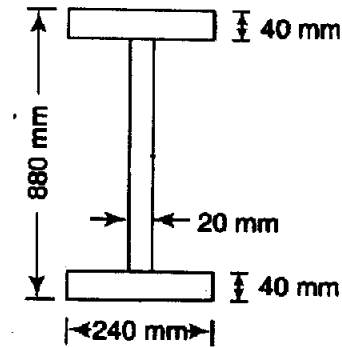
- Find the thickness of metal necessary for a cylindrical shell of internal diameter 160 mm to withstand an internal pressure of 8 N/mm^2 . The maximum hoop stress in the section is not to exceed 35 N/mm^2 . 10

Section B

- A steel disc of uniform thickness and of diameter 900 mm is rotating about its axis at 3000 rpm. Determine the radial and circumferential stresses at the centre and outer radius. The density of material is 7800 kg/m^3 and Poisson's ratio = 0.3. 10
- Deduce expressions for radial and hoop stresses induced in a long rotating hollow cylinder. 10

Section C

- A simply supported beam of I-section as shown in figure deflects 12 mm when subjected to a uniformly distributed load of 50 kN/m length. Determine the safe load if the beam is used as a column with both ends fixed. Use Euler's formula with a factor of safety 5. $E = 205 \text{ GPa}$. 10



- A closely coiled helical spring of round steel wire 10 mm in diameter having 10 complete turns with a mean diameter of 12 cm is subjected to an axial load of 200 N. Determine (i) the deflection of the spring (ii) maximum shear stress in the wire (iii) stiffness of the spring. Take modulus of rigidity $C = 8 \times 10^4 \text{ N/mm}^2$. 10

Section D

- Explain the Winkler-Bach theory as applicable to bars of large initial curvature. 10
- A 4 m long simply supported beam of 80 mm width and 100 mm depth carries a load of 10 kN at the midspan. The load is inclined at 30° to the vertical