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Total No. of Pages : 03

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B.Tech (ME) (Sem.-4)

STRENGTH OF MATERIALS-II

Subject Code : BTME-401

M.Code : 59129

Date of Examination: 20-11-2023

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Question No.1 is Compulsory. Each question carry TWO marks.
2. Attempt any FOUR questions from section-B. Each carries FIVE marks.
3. Attempt any TWO questions from section-C. Each carries TEN marks.
4. Assume missing data, if any, suitably.

SECITON-A

1. Answer briefly :

a) Differentiate between strain energy and shear strain energy.

b) State various assumptions made in Lame's theory for thick cylinders.

c) What are the various types of springs?

d) What are the types of stresses induced in a pressure vessel due to internal pressure?

e) State Castigliano's theorem.

f) What is the significance of theories of failure in mechanical design?

g) How thickness of a disc varies w.r t. radius for a rotating disc of uniform strength?

h) Which is the most suitable section of crane hook and why?

i) Draw the shear stress distribution for a I section in case of loaded beam.

j) Enlist various theories of failure.

SECTION-B

2. State and explain any two theories of failure along with their graphical representation

3. Derive the expressions for hoop and longitudinal stresses for a thin cylinder of inter diameter d, material thickness t, when subjected to internal fluid pressure p.

4. A bar is applied an axial pull as shown in the figure 1 such that the maximum stres induced is 150 MPa. The larger and the smaller areas of cross-section are 240 mm^2 an 120 mm^2. Determine the strain energy stored in the bar. E= 205 GPa.

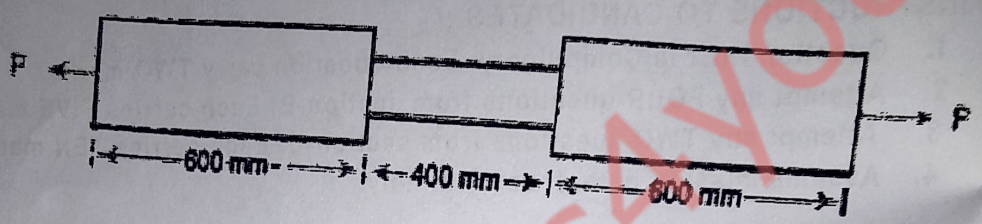

FIG. 1

5. Find safe RPMs for a 2 m diameter thin uniform circular ring of cross-sectional area 1 cm^2, if the density of material and permissible tensile stress respectively are 7850 kg/m^3 and 144N/mm^2, respectively.

6. Determine the resultant stresses at P and Q of a circular cross-section circular ring having a saw cut along horizontal diameter as shown in figure 2.

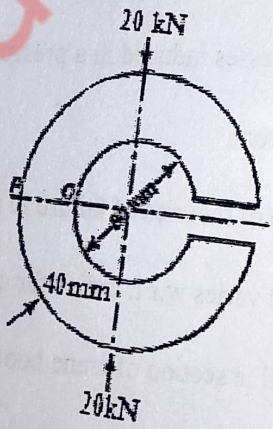

FIG. 2

SECTION-C

7. A T section beam (cross-section shown in figure 3) of 2.5 m span carries a UDL of 140 kN/m over the whole span. Determine the maximum shear stress in the beam and draw the shear stress distribution for the section. Given: the position of neutral axis from the top is 53.08 mm.

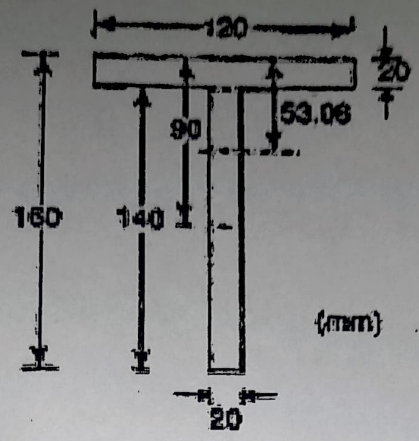

FIG. 3

8. A thick cylindrical shell closed at both ends is made of 5 cm thick plate to contain a gas at a pressure of 5 N/mm^2. If the internal diameter of this shell is 30 cm, find a) longitudinal stress, b) radial stress at radius 17 cm, and c) hoop stress at outer side of this shell.

9. It is required to design a close coiled helical spring which shall deflect 10 mm under an axial load of 100 N at a shear stress of 90 N/mm^2. The spring is to be made out of a round wire having modulus of rigidity of 8×10^4 N/mm^2. The mean diameter of the coils is to be 10 times the diameter of wire. Find the diameter and length of the wire necessary to form the spring.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.