Code No.: ME301PC

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CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Regular) - January- 2022
MECHANICS OF SOLIDS
(MECH)

[Time: 3 Hours]   [Max. Marks: 70]

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A   (20 Marks)

1. a) Write different types of stresses and Strains with neat sketch & Examples   [2M]
   b) Define the term "Factor Safety"   [2M]
   c) Write about Sign Convention of S.F and B.M with neat sketches.   [2M]
   d) Write the formula for the simple supported beam with point load at the centre   [2M]
   e) Write the bending equation and explain each specification.   [2M]
   f) Draw the shear stress distribution across the rectangular beam   [2M]
   g) What are the Theories of Failures and Explain with their formulas?   [2M]
   h) Explain the Mohr's circle of stresses   [2M]
   i) Write the Torsion equation?   [2M]
   j) Distinguish between the Stresses and Strains induced in thin cylinders with neat sketch. [2M]

### PART-B   (50 Marks)

2. a) Derive Equation of deformation of body due to force acting on it?   [4M]

   b) A Hollow cylinder 2m long has an outside diameter of 50mm and inside diameter of 30mm. If the cylinder is carrying a load of 25KN, find the stress in the cylinder *and also* find the deformation of the cylinder, if the value of E=100Gpa. [6M]

OR

3. Two wires, one of the steel and other of copper, are of the same length and are subjected to the same tension. If the diameter of the copper wire is 2mm, find the diameter of the steel wire, if they are elongated by the same amount. Take E for steel as 200Gpa & that for copper as 100Gpa.   [10M]

4. a). Derive Bending Equation with neat sketch.   [4M]

   b). A Cantilever beam of length 2m carries the point loads as shown in fig. Draw S.F.D and B.M.D.   [6M]
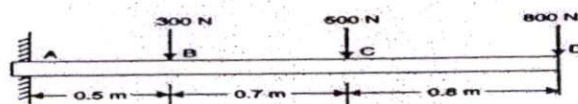
OR

5. If the tension test bar is found to taper from (D+a) diameter to (D-a) diameter, prove that the error involved in using the mean diameter to calculate young's modulus is $(10a/D)^2\%$.   [10M]

6. a). Write Assumption made in the theory of pure torsion? Derive Torsion equation. [5M]

b). A Hollow shaft is the transmit 300kW power at 80rpm. If the shear stress is not to exceed 60 N/mm^2 and the internal diameter is 0.6 of the external diameter, find the external and internal diameters assuming that the maximum torque is 1.4 times the mean. [5M]

OR

7. a). A Cylinder shell is 3m long and is having 1m internal diameter and 15mm thickness. Calculate the maximum intensity of shear stress induced and also the changes in the dimensions of the shell, if it is subjected to an internal fluid pressure of 1.5 N/mm^2 .Take E=2x10^5 N/mm^2 μ=0.3 L4

b).Write changes in Dimensions of thin spherical shell due to internal pressure. [3M]

8. The unsymmetrical I-Section shown in figure is subjected to a shear stress of 40 KN. Draw the shear stress variation diagram. [10M]
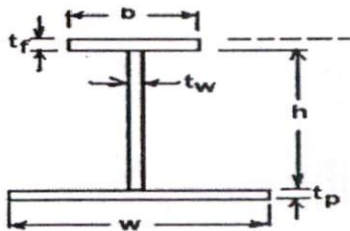
b=80 mm, w= 160 mm, t$_f$=t$_p$=t$_w$= 20 mm and h= 200 mm.

OR

9. Derive equations of Shear Stress across a few standard Sections of Rectangular, Circular and Isosceles Triangle [10M]

10. The Stresses at point of a machine component are 150 Mpa and 50 Mpa both tensile. Find the intensities of normal. Shear and resultant stresses on a plane inclined at an angle of 55 degrees with the axis of major tensile stress. Also find the magnitude of the maximum shear stress in the component. [10M]

OR

11. A Plane element in body is subjected to a tensile stress of 100 Mpa accompanied by a clockwise shear of 25 Mpa. Find i) the normal and shear stress on a plane inclined at an angle of 20 degrees with the tensile stress. ii) the maximum shear stress on the plane [10M]

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