H.T.No. | | | | | | | | | | |

Code No: ME1509 **GEC-R14**

II B.Tech I Semester Regular Examinations, November 2016

MECHANICS OF SOLIDS

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 60**

Note: All Questions from **PART-A** are to be answered at one place.
Answer any **FOUR** questions from **PART-B.** All Questions carry equal Marks.

PART-A

6 × 2 = 12M

1. Define the terms Ductility, Hardness and toughness?
2. What is the difference between moment of inertia, slenderness ratio and modulus of a section?
3. Write the relations among force, slope and deflection?
4. Draw the shear stress distributions of Rectangular and Circular sections of beams?
5. State Mohr's Theorems?
6. How do you distinguish Thin and Thick Cylinders?

PART-B

4 × 12 = 48M

1. a) A reinforced concrete column 45cm X 45cm has four steel rods 25mm diameter embedded in it. Find the stresses in steel and concrete when the total load on the column is 1000 KN. Find also the adhesive force between the steel and concrete. E_S = 205kN/mm^2, E_c = 13.6 kN/mm^2. (7M)

   b) A steel hoisting wire of 5mm diameter and 100m long is used vertically to lift a load of 2000N at its lowest end. Determine the total elongation of the wire. E = 205 kN/mm^2 (5M)

2. a) A hollow cast iron column with fixed ends supports and axial load of 1000kN. If the column 5m long and has an external diameter of 250mm, find the thickness of metal required. Use the Rankine's formula, taking constant of 1/6400 and assume a working stress of 80N/mm^2. (7M)

   b) Calculate the strain energy in a bar 3m long and 40mm diameter when it is subjected to a tensile load of 100kN. Take E = 2.05 x 10^5 N/mm^2. What will be the modulus of resilience of the material of the bar? (5M)

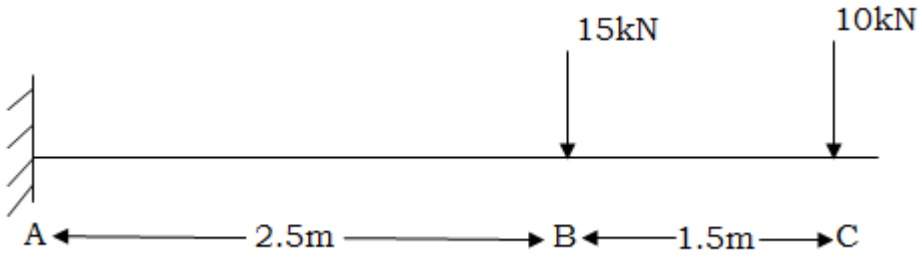
3. a) A beam of AB 5m long is simply supported at A and B. It is loaded with point loads of 20kN, 30kN and 20kN at distances of 1m, 3m and 4m respectively from the support A, and a uniformly distributed load at the rate of 20kN/m over length of 2m, the beginning of the UDL being at a distance of 2m from A. Draw BM and SF diagrams, indicate the principal values. (7M)

   b) Compare the flexural strength of the following three beams of equal weight (i) I-section 20cm x 15cm, having 2cm as flange thickness and 1cm as web thickness. (ii) Rectangular section having depth equal to 1.75width. (iii) Solid circular section. (5M)

4. a) The cross section of a joist is a T section 150mm x 100mm x 13mm with 150mm side horizontal. Find the maximum intensity of shear stress and sketch the distribution of stress across the section if it has to resist a shear force of 80kN. (7M)

   b) Prove that in a rectangular section, the maximum intensity of shear stress is 1.5 times the mean intensity over the whole section. (5M)

5. Determine the slope and deflection at the free end of cantilever beam as show in the Figure by Macaulay's method, Take EI = 8000kN-m^2. (12M)



6. A cylindrical shell is 3m long, 1m internal diameter and 15mm metal thickness. Calculate the maximum intensity of shear stress induced and also changes in the dimensions of the shell if it is subjected to an internal pressure of 1.5N/mm^2. Take E = 0.204 X 10^{6}N/mm^2 and poison's ratio=0.3. (12M)

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