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MLR 15

Code No: A10308

MLR INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

II B.Tech I Semester Regular Examinations- December-2016

MECHANICS OF SOLIDS

(Common to Mech & Aero)

Time: 3 hours Max. Marks: 75

Note: 1. This question paper contains two parts A and B
2. Part A is compulsory which carries 25 marks .Answer all Questions in part A.
3. Part B consists of 5 units. Answer any one full question from each unit. Each question carriers 10 Marks and may have a, b,c sub questions.

PART-A

1. a) Explain thermal stresses. [2M]
   b) Draw SFD and BMD for cantilever beam with UDL [2M]
   c) Draw the shear stress diagram for I- section [2M]
   d) Define principal stresses and planes [2M]
   e) What is the volumetric strain of thin cylinders [2M]

2. a) Explain hook's law [3M]
   b) From first principles derive the relation between the three elastic constants [3M]
   c) Explain shear force and bending moment. [3M]
   d) Write the assumptions of theory of simple bending equation. [3M]
   e) Derive torsion equation of circular shaft [3M]

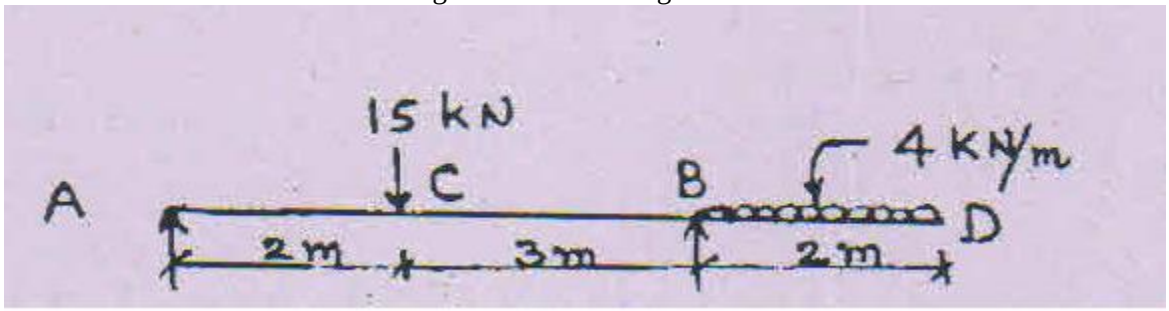
PART-B

3. A reinforced concrete column of 400 mm x 400mm has four steel rods of 20 mm embedded in it. [10M]
   Find the stresses in steel and concrete when the total load on the column is 1000 KN.
   E_s = 210 KN/mm^2 and E_c = 13.5 KN/mm^2

OR

4. A gun metal rod screwed at the end passes through a steel tube. The tube has 25 mm external diameter 20 mm internal diameter. The diameter of the rod is 16 mm. The assembly is heated to 400 K and the nuts on the rod are then tightly screwed home on the ends of the tube. Find the intensity of stress in the rod and in the tube, when the common temperature falls to 100 K. [10M]
   Coefficient of thermal expansion of steel = 12 x 10^{-6} per K
   Coefficient of thermal expansion of gunmetal = 20 x 10^{-6} per K
   E_s = 0.91 x 10^5 N/ mm^2
   E_g = 2 x 10^5 N/ mm^2

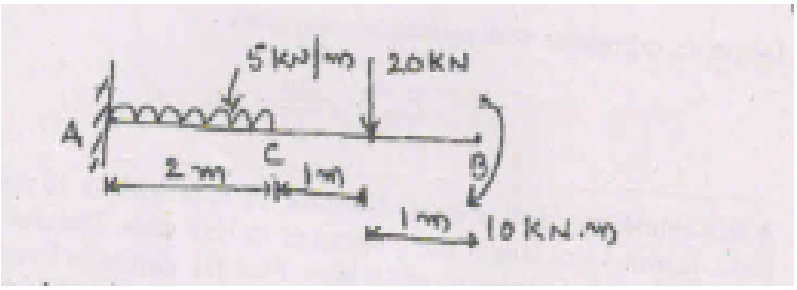
5. Draw SFD and BMD of the following beam shown in figure [10M]



OR

[10M]

6 Draw SFD and BMD of the following beam shown in figure



7 A beam of 36 cm deep of symmetrical section has I=8000 cm^4 is simply supported over a span of 8m. Calculate i)the uniformly supported load it may carry ii) the concentrated load it may carry at the centre. Maximum allowable stress= 111 N/mm^2. [10M]

OR

8 A beam of I-section, 60 cm deep and 19 cm wide, has flanges 4 cm thick and web 1.6 cm thick. It carries a shearing force of 400 KN at a section. Draw shear stress distribution diagram. [10M]

9 Determine principal stresses and its planes, If σ_x = 70 N/mm^2, σ_y = 25 N/mm^2 and σ_{xy} = 30 N/mm^2 . Also determine maximum shear stress and its position [10M]

OR

10 Determine the maximum deflection and slope of the following beam [10M]
Take I= 7000 cm^4 and E=2.0 x 10^5 N/mm^2

11 A hollow shaft with inner diameter to outer diameter ratio of 0.8 is to transmit a torque of 2600 N-m. Taking the allowable shear stress for the shaft material as 46 MPa and the limiting angle of twist in 2 m length of shaft as 1.6^0. Determine the inner and outer diameters of the shaft take G=81 KN/mm^2 [10M]

OR

12 A thin cylindrical shell of 0.6m diameter and 0.9 m long is subjected to an internal pressure 1.2 N/mm^2. Thickness of cylinder wall is 15mm. Determine change in diameter, length and volume. Take E=200GPa and poisson's ratio=0.3 [10M]