May/2018 SE/IV/MTRX/SCM/CBSGS. (10)

May-18

Q.P. Code: 50219

Duration: 3 Hours **Marks: 80**

Q.1 Attempt any Four **[20]**

(a) What are assumption are taken in the analysis of thin cylinder? Write formulae for hoop stress.

(b) What is Macaulay's method of beam deflection analysis? What are the advantage over the direct integration method?

(c) Determine the length of central bore of 20 mm diameter to be made in steel tie rod of 50 mm diameter and 2.5 m long when it is subjected to pull of 100kN so that it extension increased by 15 % of that without bore. Take E=200Gpa.

(d) A steel plate of width 120 mm and thickness 20 mm is bend into a circular arc of radius 10mm determine stress induced and bending moment which will produce the maximum stress. Take $E = 2\times10^5$ N/mm^2.

(e) What are the assumption are taken in the analysis of shear stress in beams?

Q.2 **(a)** Determine the dia. of solid shaft, which will transmit 300 kW at 250 r.p.m and the working condition to be satisfied are: The twist should not be more than 1° in a shaft of length 2 m and the maximum shear stress should not exceed 30 N/mm^2. Take $G = 1\times10^5$ N/mm^2. **[10]**

(b) A cylindrical thin drum 80 cm in dia. and 3 m long has a shell thickness of 1 cm. If drum is subjected to internal pressure of 2.5N/mm^2, determine (i) the change in diameter (ii) change in length and (iii) change in volume. Take $E = 2\times10^5$ N/mm^2 and poisons ratio = 0.25. **[10]**

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Q.3 **(a)** Calculate the instantaneous stress produced in a bar 10 cm^2 in area and 3 m long by the sudden application of a tensile load of unknown magnitude ,if the elongation of the bar due to suddenly applied load is 1.5 mm. Also determine the suddenly applied load .Take $E=2\times10^5$ N/mm^2. **[10]**

(b) A beam of length 6 m is simply supported at its ends and carries two point loads of 50 kN and 45 kN at a distance of 1 m and 3 m respectably from the left support. Find:

(i) Deflection under each load,

(ii) Maximum deflection, and

(iii) The point at which the maximum deflection occurs.

Take $E= 2\times10^5$ N/mm^2 and $I = 85\times10^6$ mm^4 **[10]**

Q.4 **(a)** A steel rod 5 m long and 30 mm in dia. is subjected to an axial load of 50kN. Determine the change in length, diameter and volume of the rod. Take $E= 2\times10^5$ N/mm^2 and Poisson ratio = 0.25. **[06]**

(b) Evaluate the extension of rectangular rod under self-weight. **[04]**

(c) A short column of rectangular cross section 80 mm by 60 mm carries a load of 40kN at point 20 mm from the longer side and 35 mm from the shorter side. Determine the maximum compressive and tensile stresses in the section. **[10]**

Q.5 **(a)** The stresses on two perpendicular planes through a point in body 30MPa and 15 MPa both tensile along the shear stress of 25 MPa. Find (i) the magnitude and direction of principal stresses. (ii) the planes of maximum shear stress (iii) the normal and shear stresses on the planes of maximum shearing stress. **[10]**

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(b) Draw S.F and B.M diagram for the loaded beam shown in fig-(1) **[10]**

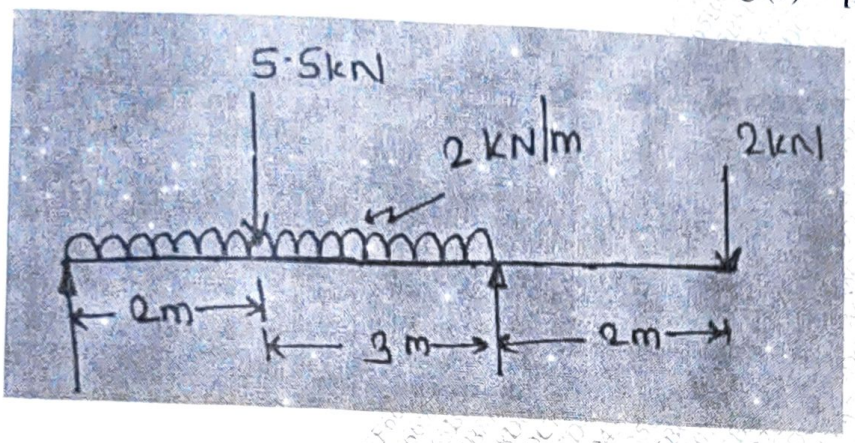
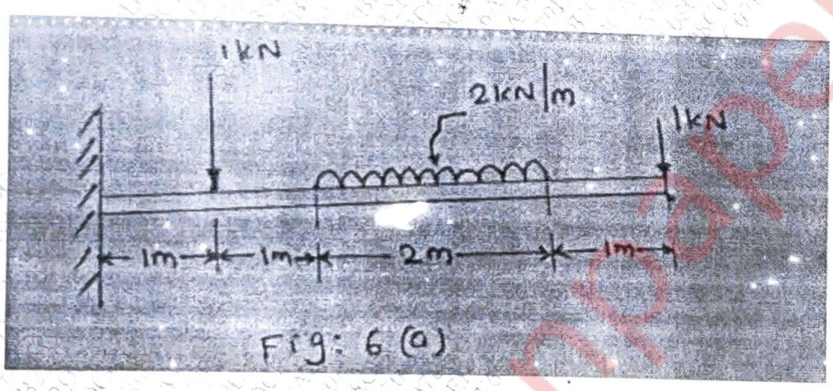


Fig. 1

Q.6 (a) Draw the Shear force and Bending diagram for the beam shown in Fig: 6(a)

[10]



(b) Two mutually perpendicular planes of an element of, material are subjected to direct stresses of 10.5 MN/m^2 (tensile) and 3.5 MN/m^2 (compressive) and shear of 7 MN/m^2.Find graphically or otherwise:

(i) The magnitude and direction of principle stress and

(ii) The magnitude of the normal and shear stress on a plane on which the shear stress is maximum. **[10]**

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