Dec 2018

B.Tech. IIIrd SEMESTER (Reappear)

Strength of Material-I (MU-201)

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

Instructions:
1. *It is compulsory to answer all the questions (2 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Assume suitable value for missing data.*

PART -A

Q1 (a) What do you mean by bar of uniform strength? (2)

(b) Write a short note on Mohr's circle. (2)

(c) Differentiate between rolled support and fixed support in beams. (2)

(d) What do you mean by 'simple bending' and 'pure bending'? (2)

(e) Explain helical springs. Name the two important type of helical spring. (2)

(f) Explain how Rankine-Gordon formula is used to calculate the intensity of stress in short, intermediate and long columns. (2)

(g) Define the term; torsion and torsional rigidity. (2)

(h) Explain the transfer formula for mass moment of inertia. (2)

(i) What is the relationship between shear force and loading function of a beam? (2)

(j) Distinguish between thin and thick pressure vessels. (2)

PART -B

Q2 A steel rod of 30 mm diameter is enclosed in a brass tube of 42 mm external diameter and 32 mm internal diameter. Each is 360 mm long and the assembly is rigidly held between two stops 360 mm apart. The temperature of the assembly is then raised by 50°C. Determine; (10)

i) Stresses in the tube and the rod.

ii) Stresses in the tube and the rod, if the stops yields by 0.15 mm

Es=205 GPa; Eb=90 GPa; a_s=11 ×10-6 per °C; a_b=19×10-6 per °C.

Q3 Draw SF and BM diagrams for the beam ABCDE shown in following Figure 1. Find the point of contra-flexure. (10)

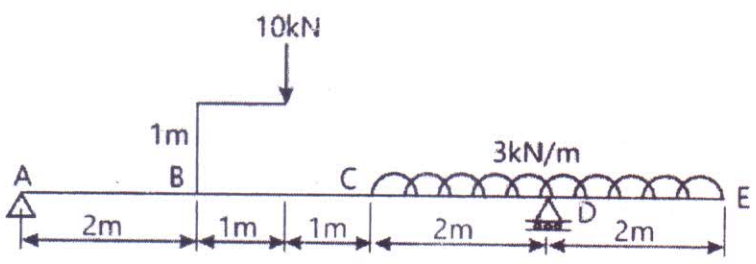

Figure 1

Q4 Following figure 2 shows a simply supported beam of uniform section whose moment of inertia is 4.3×10^8. mm^4. For the loading shown, and the position and magnitude of the maximum defection. Take E=200 kN/mm^2. (10)

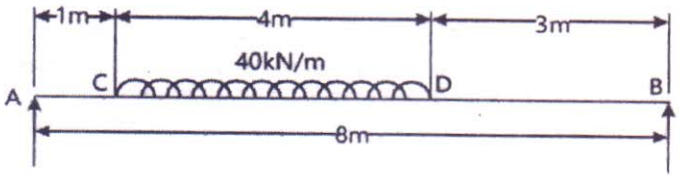

figure 2

Q5 A hollow C.I. column whose outside diameter is 250mm has a thickness of 15 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety 4. Calculate slenderness ration & Rankine's critical load. (10)

Take $\sigma_c = 55\ N/mm^2$, $a=\frac{1}{600}$

Take E = 9.4×104 N/mm^2.

Q6 A hollow shaft transmits 100 kW at 120 r.p.m. Allowance shear stress in material is 50N/mm^2. Shaft shall not twist 2° in 1m length. Ratio of Internal diameter to external diameter is 0.25. Take G = 80 kN/mm^2. Maximum torque is 15% more than mean torque. Calculate maximum external diameter of a shaft. (10)

Q7 (a) What is Macaulay's method? Derive an expression for deflection at any section of a simply supported beam with eccentric point load, using Macaulay's method. (7)

(b) What is a flat spring? Deduce an expression for the rotation of the spring. (3)

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