K-120

Total No. of Pages : 3

Seat No.	

S.E. (Civil) (Semester-III) Examination, 2013

STRUCTURAL MECHANICS-I

Sub. Code : 42656

Day and Date : Saturday, 08-06-2013 **Total Marks : 100**

Time : 2.30 p.m. to 5.30 p.m.

Instructions :
1) **Solve any three questions from section-I and any three from section-II.**
2) **Figures to the right indicate full marks.**
3) **Use of Non-Programmable scientific calculator is allowed.**
4) **Assume any suitable data, if required and clearly mention it.**

SECTION-I

Q1) a) Draw stress-strain curve for mild steel specimen subjected to tension. Explain salient features. **[6]**

b) Two vertical rods, one of steel and the other of bronze are rigidly fastened at upper ends at a horizontal distance of 760mm apart as shown in fig. 1. Each rod is 3m long and 25mm in diameter. A horizontal cross piece connects the lower ends of the bars. Where a load of 4.50 kN should be placed on the cross piece, so that it remains horizontal after being loaded? Determine the stresses in each rod. Take Es =210 GPa., Eb = 112.5 GPa. **[12]**

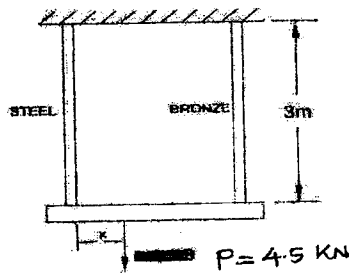


Fig 1

Q2) a) Derive the relationship among E, G and K. **[4]**

b) A bar of steel is 60mm x 60mm in section and 180mm long. It is subjected to a tensile load of 300kN along the longitudinal axis and tensile loads of 750 kN and 600 kN on the lateral faces of bar. Find the change in dimensions and change in volume of the bar.

Take E = 200 GPa. And 1/M = 0.30. **[12]**

P.T.O.

Q3) a) Draw SFD and BMD for a cantilever beam subjected to U.D.L–w per unit meter. **[6]**

b) Draw SFD and BMD for the beam as shown in fig. 2. **[10]**

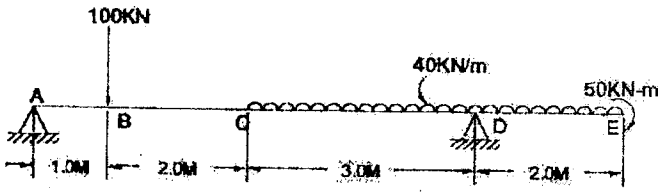


Fig 2

Q4) a) Define thin cylinders. Name the stresses set up in thin cylinder subjected to internal fluid pressure. **[4]**

b) A cylindrical vessel whose ends are closed by means of rigid flange plates is made of steel plate 3mm thickness. The internal length and diameter of vessel are 50cm and 25cm respectively. Determine the longitudinal and circumferential stresses in the cylindrical shell due to an internal fluid pressure of 3 MPa. Also calculate increase in length, diameter and volume of the vessel. Take E = 200 GPa. and 1/M = 0.30. **[12]**

SECTION-II

Q5) a) Derive the expression for flexural formula. **[6]**

b) A timber beam 160mm wide and 200mm deep is to be strengthened by bolting two steel plates each 160mm x 10mm at top and bottom surfaces. The composite beam is simply supported at its ends and carries a u.d.l. of 20 kN/m over an effective span of 4m. Find the max. bending stress in the steel and timber at the mid span.

Take- E_s- 2×10^5 N/mm^2 &

E_t- 1×10^4 N/mm^2. **[11]**

Q6) a) Draw shear stress distribution diagram for -L, T and I section. **[6]**

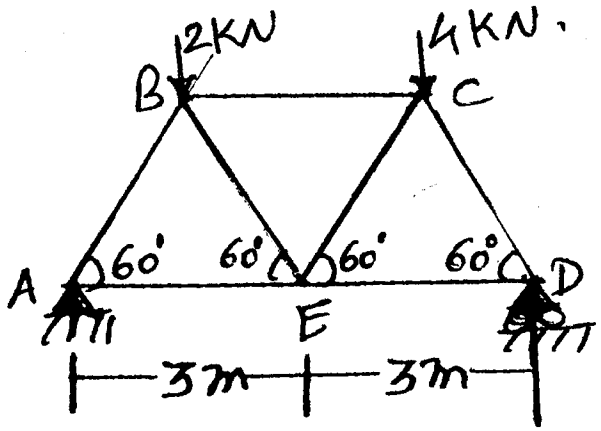
b) A beam of channel section 120mm x 60mm has uniform thickness of 15mm (web is vertical). Draw shear stress distribution diagram for the section. The beam of span 4m is simply supported at ends and subjected to point load of 100kN at its centre. Also find the ratio of the maximum to mean shear stress. **[11]**

Q7) a) Find an expression for the strain energy due to bending for a beam of length l, simply supported at the ends and carrying a u.d.l.-W/m over whole span. The beam is of constant cross-section throughout its length having flexural rigidity-EI. **[8]**

b) An object of 100N weight falls by gravity in vertical distance of 5m. When it is suddenly stopped by a collar at the end of a vertical rod of length 10m and diameter 20mm. The top of the bar is rigidly fixed. Calculate the maximum stress and strain induced in the bar due to impact. Take-E-200 GN/m^2. **[8]**

Q8) a) Explain method of section- **[4]**

b) Find the forces in all the members of the truss loaded and supported as shown in fig. **[12]**



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