Total No. of Questions : 8]

SEAT No. :

P3853

[Total No. of Pages : 4

[5057] - 203

S.E. (Civil) (Semester - I)

STRENGTH OF MATERIALS

(2012 Pattern)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates :

1) *Neat diagrams must be drawn wherever necessary.*
2) *Figures to the right indicate full marks.*
3) *Use of electronic pocket calculator is allowed.*
4) *Assume suitable data, if necessary.*
5) *Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 and Q. No. 7 or Q. No. 8.*

Q1) a) A compound bar ABC 2m long is made up of two parts 'AB' of aluminum and 'BC' of steel having cross sectional area of steel half of the aluminum bar. The rod is fixed at 'A' and subjected to an axial pull of 250kN at end 'C'. If the elongations of both materials is equal, find the lengths of each part assuming E_{steel} = 200GPa and $E_{aluminium}$ as one third of steel. **[6]**

b) A simply supported beam 7m span carries u.d.l. of 5kN/m over entire span. Find the maximum bending stress induced if the cross section is as shown in Fig. 1.1. **[6]**

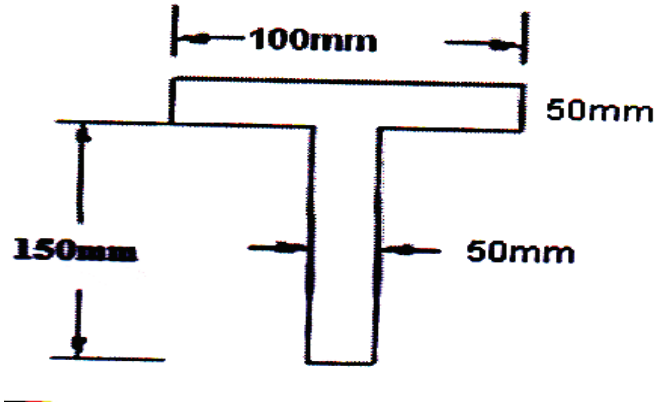

Figure 1.1

OR

P.T.O.

Q2) a) A steel bar 2m long is at 30° C. The temperature of the rod is increased by 115° C. Find **[6]**

i) free expansion of the rod

ii) temperature stress produced if expansion is prevented and nature of the stress

iii) stress produced if 2.5mm expansion is permitted. Assume supports are unyielding? Take E = 210 GPa, and $\alpha = 12 \times 10^{-6}$ /° C, Assume bar diameter = 18mm.

b) An I section has following dimensions. Web: 250mm × 10mm, Flanges: 150mm × 20 mm. The maximum shear stress developed in the beam is 20 MPa. Find the sheer force to which the beam is subjected. **[6]**

Q3) a) Find maximum torque that can be safely applied to a shaft of 80mm diameter. The permissible angle of twist is l° in a length of 3m and shear stress not to exceed 42 MPa. Take G= 84 MPa. **[6]**

b) A shaft of 95 mm diameter transmits 200 KW power at 100 rpm. If at a section bending moment is 15 kN-m, find the principal stress, maximum shear stress. **[6]**

OR

Q4) a) A steel rod 25 mm in diameter is 3.5m long. Find the maximum instantaneous stress induced and workdone at maximum elongation when a load of 100 kN is suddenly applied. Take E =210 GPa. **[6]**

b) A hollow shaft having an inside diameter 75% of its outer is to replace a solid shaft transmitting the same power at same speed. Calculate the percentage saving in material if material to be used is also the same. **[6]**

Q5) a) An overhanging beam ABC simply supported at ‘A’ and ‘B’ is loaded with udl of intensity 50kN/m acting on 3m length from ‘A’ and a point load of 15kN acting at free end ‘C’. Draw B.M.D. and S.F.D. Assume l(AB) = 4m and l(BC) = 1m. **[7]**

b) Draw shear force diagram, bending moment diagram for the beam ABCD with end 'A' hinged and loaded as shown in Figure 5.1. **[6]**

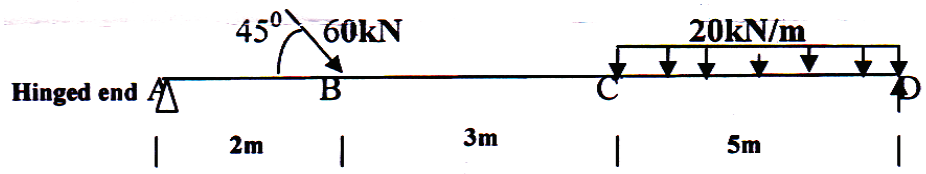

Figure 5.1

OR

Q6) a) Draw shear force diagram and bending moment diagram for the beam as shown in fig.6. 1. Indicate the numerical values at all important section. Find the position and value of maximum bending moment. **[7]**

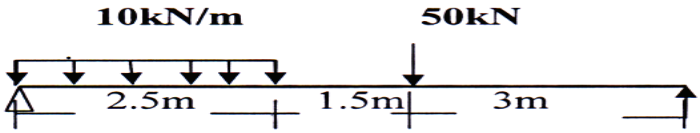

Figure 6.1

b) The diagram shown in fig. 6.2 is the shear force diagram for a beam which rests on two supports, one being at the left hand end. No couple is acting on beam. Draw BMD and load diagram. **[6]**

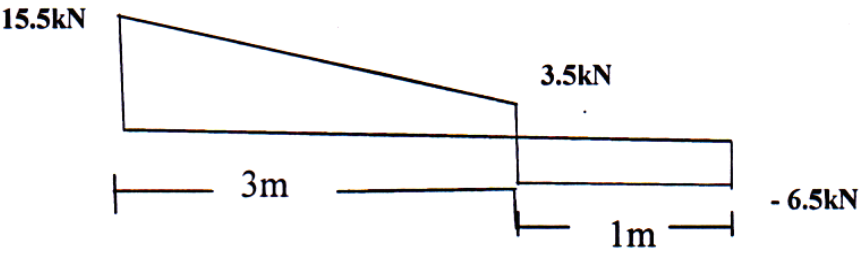

Figure 6.2

Q7) a) Compare the crippling loads given by the Euler's and Rankine's formula for a circular column of 40mm diameter and 2000m long. Take yield stress as 300MPa. Rankine's constant a =1 /7500 and E = 200GPa. Assume column fixed at one end and free at another end. **[6]**

b) State assumptions made in Euler's theory and its limitations. **[7]**

OR

Q8) a) Explain core of the section and hence obtain a core section for a hollow circular column of external and internal diameter 'D' and'd' respectively. **[6]**

b) A hollow rectangular section is having external size 500mm × 350 mm and internal size 400 mm × 250mm. It carries a vertical load of 100 kN at the outer edge of the column on X-axis. Calculate maximum and minimum intensities of stress in the section. **[7]**