Total No. of Questions : 4]

SEAT No. :

PE586

[Total No. of Pages : 3

[6578]-59

S.E. (Automobile & Mechanical/Mech. Sandwich/ Automation & Robotics) (Insem)

SOLID MECHANICS

(2019 Pattern) (Semester - III) (202041)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data, if necessary.***

Q1) a) A circular steel bar having three segments is subjected to various forces at different cross sections as shown in fig 1 (a). Determine the necessary force to be applied at section C for the equilibrium of the bar. Also find total elongation of the bar. Take E = 200 GPA. **[8]**

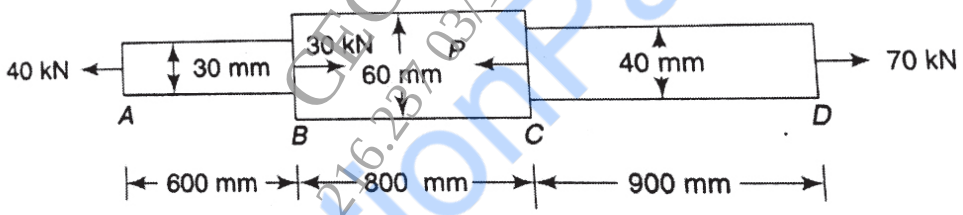

Fig.1 (a)

b) A bar of metal 100 mm × 50 mm in cross-section is 250 mm long. It carries a Tensile load of 400 kN in the direction of its length, a compressive load of 400 kN on its 100 mm × 250 mm faces and a tensile load of 2000 kN on its 50 mm × 250 mm faces : **[7]**

If E = 200 GPa and Poison's Ratio is 0.25, Find the change in Volume of the bar.

OR

P.T.O.

Q2) a) A load of 270 kN is acting on a short RCC column of size 200 mm × 200 mm. The column is reinforced with 10 bars of 12 mm diameter. Determine the stresses in steel and concrete if E for steel is 16.5 times of that of concrete. **[8]**

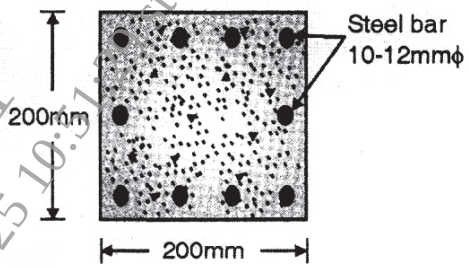

Fig.2 (a)

b) Rails of 12 m length each are laid on the track in the morning when the atmospheric temperature was 12ºC, a gap of 3 mm was kept between two consecutive rails. **[7]**

i) At what maximum temperature the rails will remain stress-free.

ii) If temperature is raised further by 10ºC than the atmospheric temperature, what will be the magnitude and stress induced in the rails.

Take E as 200 GPa and $\alpha = 12 \times 10^{-6}$/ºC.

Q3) a) Draw the Shear Force and Bending Moment diagrams for the beam which is loaded as shown in figure 3 (a). Find the position of contraflexure if any, magnitude and position of maximum B.M. **[7]**

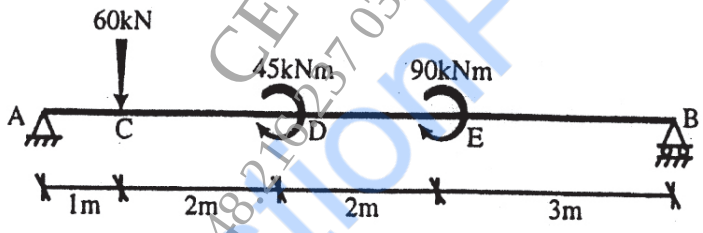

Fig. 3 (a)

b) Draw Shear force diagram and Bending moment diagram for the beam shown in fig. 3 (b). Find the position of contraflexure if any, magnitude and position of maximum B.M. **[8]**

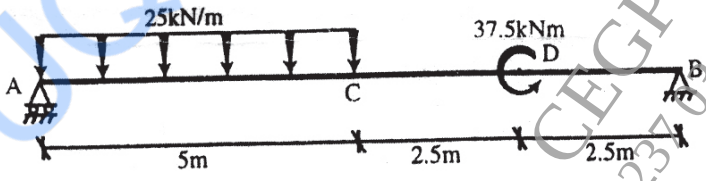

Fig.3 (b)

OR

Q4) a) Draw S.F.D. and B.M.D. for the beam Shown in fig. 4 (a). Find the position of contraflexure if any, magnitude and position of maximum B.M. **[7]**

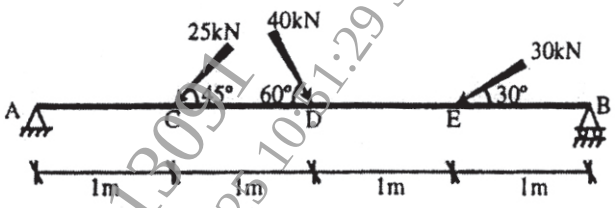

Fig.4 (a)

b) Draw S.F.D. and B.M.D. Find the position of contraflexure if any, magnitude and position of maximum B.M. **[8]**

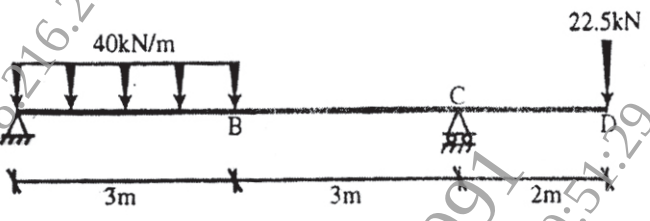

Fig.4 (b)