Total No. of Questions : 4]

SEAT No. :

P5432

[Total No. of Pages : 3

[6186]-560

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

SOLID MECHANICS

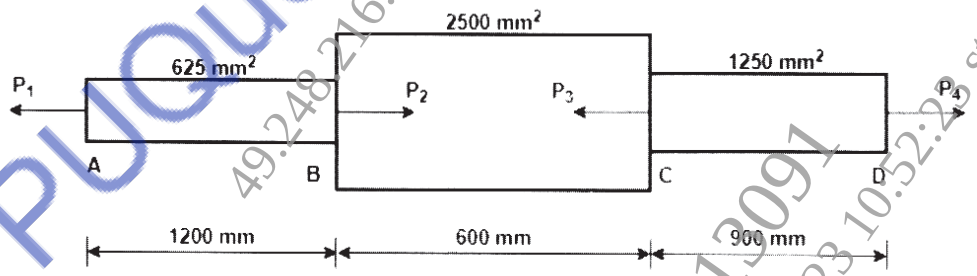
(2019 Pattern) (Semester-III) (202041)

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 member ABCD is subjected to a point loads P_1, P_2, P_3 and P_4 as shown in Fig. Calculate the force 'P_2' necessary for equilibrium, if $P_1 = 45kN$, $P_3 = 450$ kN and $P_4 = 130$ kN. Determine stress in each member, assuming the modulus of elasticity to be 2.1×10^5 N/mm^2. **[7]**



b) A steel rod 2 m long is at 30ºC. The temperature of this rod is increased to 150ºC find. **[8]**

i) Free expansion of the rod

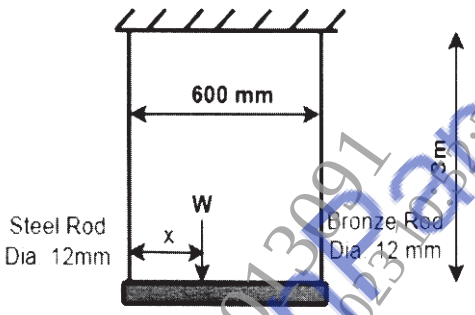
P.T.O.

ii) Temperature stress produced if expansion is prevented and nature of stress.

iii) Stress produced if 2 mm expansion is permitted and nature of stress if $\alpha = 12\times10^{-6}/^{o}C$ and E = 200 GPa, Bar diameter = 16mm.

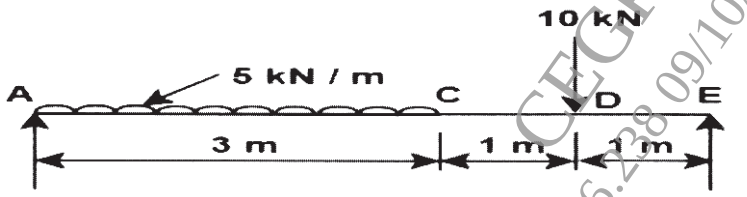
OR

Q2) a) Two vertical rods one of steel and one of bronze suspended at a distance of 600 mm apart. Each rod is 3 m long, 12 mm in diameter as shown in Fig. A horizontal cross bar connect the lower ends of the rod on it placed a load of 4500 N so that cross bar remains horizontal. Find the position of the load on the cross bar and stresses in each rod. $E_{steel}=1.96\times10^{5}$ MPa, $E_{bronze} = 0.63\times10^{5}$ MPa. **[7]**

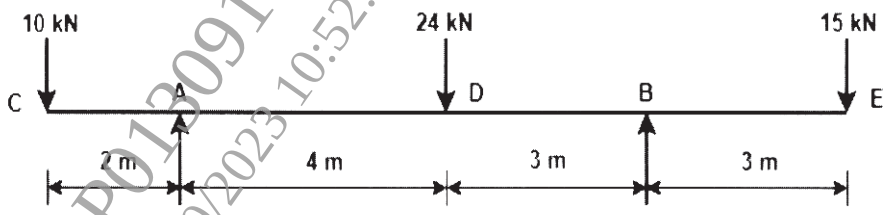


b) In a tensile test on steel tube of external diameter 18 mm and internal diameter 12 mm, an axial pull of 2kN produces stretch of 6.72×10^{-3} mm in a length of 100 mm and lateral contraction of 3.62×10^{-4} mm in an outer diameter. Calculate the values of three Modulii and Poisson's ratio of material. **[8]**

Q3) a) A simply supported beam AE is loaded as shown in Fig. Draw shear force and bending moment diagram indicating maximum bending moment and determine its value. **[7]**



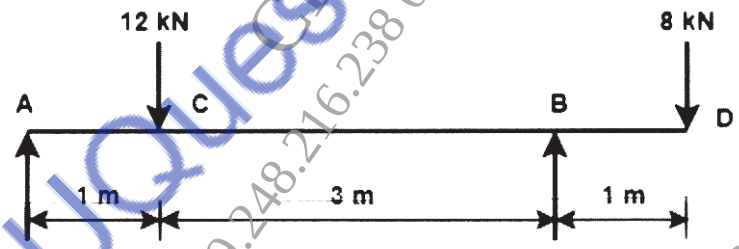
b) For an overhanging beam as shown in Fig. Draw shear force and bending moment diagram. Determine the point of contraflexure within the span AB. **[8]**



OR

Q4) a) Draw shear force and bending moment diagram of a cantilever beam AB of 4 m long having fixed end at 'A' and loaded with uniformly distributed load of 2 kN/m up to 2 m from end B and with a concentrated load of 3 kN at 1 m from end A. **[7]**

b) An overhanging beam loaded and supported as shown in Fig. Draw shear force and bending moment diagram. Also find the point of contraflexure if any. **[8]**



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