Total No. of Questions : 8]

P-9171

SEAT No. :

[Total No. Of Pages : 4

[6179]-298
SE (P.E & I.E/RA/Production S.W)

Strength of Material
(2019 Pattern) (Semester - III) (211082)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8***
2) ***Use of scientific calculator is allowed.***
3) ***Figures to the right side indicate full marks.***

Q1) a) Define Bending Stresses in Beam ,Neutral Axis and Section Modouls What are Assumption made in the theory of Simple bending. **[5]**

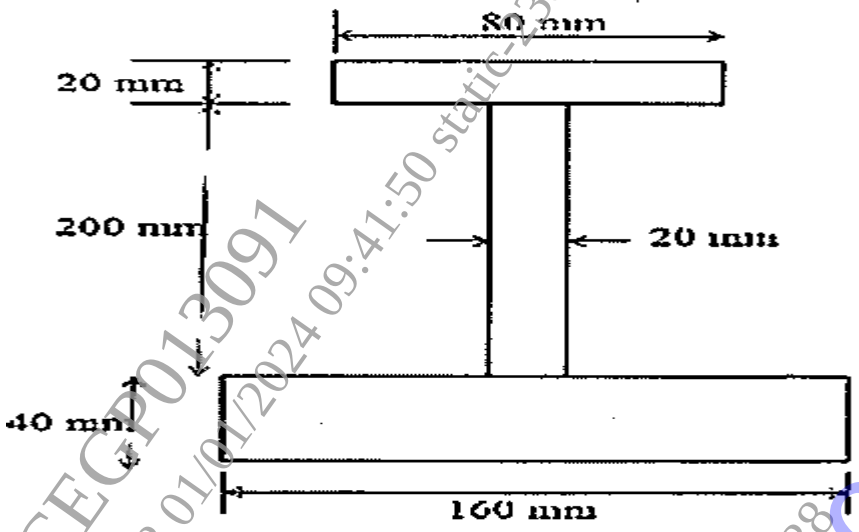
b) Prove that $\frac{M}{1}=\frac{\sigma}{y}=\frac{E}{R}$ Where, M is bending moment, I is moment of inertia, σ is stress at any fiber at a distance of y from the neutral axis, E is Modulus of elasticity, and R is radius of curvature. **[6]**

c) A Sequre beam of 20 mm x 20 mm in section and 2 m long us supported at the ends. The beam fails when a point load of 400N is applied at the centre of the beam. What uniformly distributed load per meter length will break a cantilever of the same material 40 mm wie.60 mm deep and 3 m Long. **[7]**

OR

Q2) a) A simply supported wooden beam of span 1.3 m having cross section 150 mm wide by 250 mm deep carries a point load W at the center. The permissible stresses are 7 N/ mm^2 in bending and 1 N / mm^2 IN SHEARING Calculate Safe Load W **[6]**

b) A cast iron beam is of the I- section as shown in Fig . The beam is simply supported on a Span of 5 meters. If the tensile stress is not to exceed 20 N/mm^2. Find the safe uniformly distributed load which the beam can carry. Also find the maximum compressive stress. **[12]**



Q3) a) Define strain energy, Resilance and proof resilience. Also derive an expression for Strain Energy due to self-weight. **[9]**

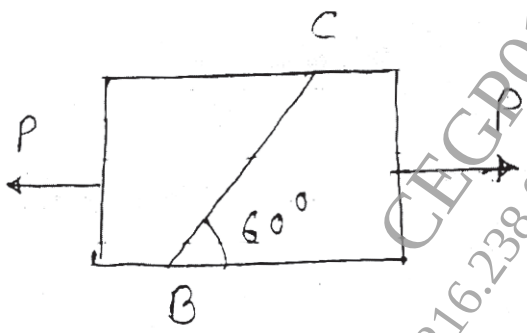
b) Calculate the Resilience and Modulus of Resilance of a bar 200 mm long, 50mm thick subjected to a tensile load of 60 KN applied gradually $E = 2 \times 10^5$ N/mm^2 **[9]**

OR

Q4) a) Explain in detail the Graphical Method for determining stress on oblique section. **[6]**

b) The stresses at a point in a bar are 200 N/*mm*^{2}(tensile) and 100 mm^2 (compressive).Determine the resultant in magnitude and direction on a plain inclined at 60°C to the axis of the major stress. Also determine the maximum intensity of shear stress in the material at The point. **[8]**

c) A rectangular bar of Crossectional area of 11000mm^2 is subjected to tensile load Path permissible normal and shear stress on oblique plane BC are 7 N mm^2 and 3.5 N mm^2 determine the Value of P **[4]**



Q5) a) Derive an expression for Toque Transmitted by hollow circular shaft Torsion. **[5]**

b) A solid steel Shaft has to transmit 75 KW at 200 rpm. Taking allowable shear stress as 70 N/mm^2, find the suitable diameter for the shaft if the maximum torque transmitted at each resolution exceed the mean by 30%. **[8]**

c) Find the maximum shear stress induced in solid circular shaft of diameter 15cm when the shaft transmits 150 KW power at 180 rpm **[4]**

OR

Q6) a) A solid Circular shaft Transmits 75 Kw power at 200 r.p.m. Calculate the shaft Diameter, if the twist in shaft not exceed 1° in 2 meters length of shaft, and shear stress is limited to 50 N/mm^2 take C= 1 × 10^5 N/mm^2 **[5]**

b) A shaft ABC of 500 mm length an 40 mm external diameter is bored for a part of its length AB, to a 20 mm diameter and for the remaining length BC to a 30 mm diameter bore. If the shear stresses not to exceed 80 N/mm^2 find the maximum power of the shaft can transmit at speed of 200 r.p.m. If the angle of twist in length of 20 mm diameter bore is equal to that in the 30 mm diameter bore find the length of the shaft that has been bored to 20 mm and 30 mm diameter. **[8]**

c) Define polar modulus and state the expression for solid Shaft and hollow shaft. **[4]**

Q7) a) What are the assumptions made in Euler's column theory? Explain the end conditions for long Column. **[5]**

b) Calculate the safe compressive load on a hollow cast-iron column (one end is rigidity fixed and other is Hinged) of 15 cm external diameter, 10 cm internal diameter and 10m length. Use Euler's formula with a factors of safety 5 and E =95k.N/mm^2 **[6]**

c) Expression for crippling load when one end of the column is fixed and other end is free **[6]**

OR

Q8) a) Determine the crippling load for T* section of dimension 10cm × 10cm × 20cm and of lengths 5m when it is used as strut both of its end are hingned.Take Young's Modulus E = 2.0 105 N/mm^2 **[6]**

b) Explain the Rankine Formula in details along with expression **[5]**

c) A hollow C.I Column whose outside diameter is 200mm has thickness of 20 mm.It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankins formula using factor of safety 4 .calculate the slenderness ratio and the ratio. **[6]**