Total No. of Questions : 8]

P-1605

SEAT No. :

[Total No. of Pages : 3

[6002]-235
S.E. (Robotics and Automation)
STRENGTH OF MATERIALS
(Semester-III) (2019 Pattern) (211082)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) *Neat diagrams must be drawn wherever necessary*
2) *Figures to the right indicate full marks*
3) *Use of calculator is allowed*
4) *Assume Suitable data if necessary*

Q1) a) A timber deam of rectangular section carries a load of 2 kN at mid-span. The beam is simply supported over a span of 3.6 m. If the depth of section is to be twice the breadth, and the bending stress in not to exceed 9 N/mm^2, determine the cross-sectional dimensions. **[8]**

b) What do you mean by Shear Stress in Beams? **[5]**

c) What do you mean by Section modulus? State the formula for section modulus of rectangular and circular section. **[4]**

OR

Q2) a) A rectangular beam of breadth 100 mm and depth 200 mm is simply supported over a span of 4 m. The beam is loaded with a uniformly distributed load of 5 kN/m over the entire span. Find the maximum bending stresses. **[8]**

b) An I section beam 350mm×200mm has a web thickness of 12.5 mm and a flange thickness of 25 mm. It carries a shearing force of 200 kN at a section. Sketch the stress distribution across the section. **[9]**

Q3) a) Using Mohar's circle, obtain the maximum shear stress in the body when it is subjected to direct tensile stress in one plane accompanied by a simple shear stress. **[8]**

b) A steel bar 50 mm×50 mm in section and 3 m in length is subjected to a axial pull of 140 KN. Calculate the strain energy stored in the bar and also find extension of the bar. Assume modulus of elasticity as 200 GPa. **[9]**

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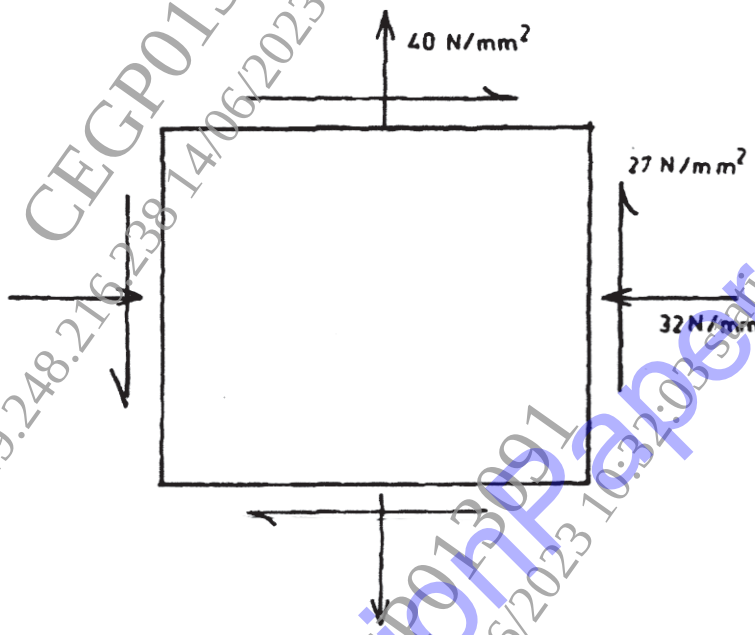
OR

Q4) a) The radius of Mohr's circle of stress of strained element is 20 MPa and a minor tensile stress is 20 MPa. Determine the major principal stress. **[7]**

b) Evaluate the principal stresses and principal planes for the state of stress shown in Figure. **[10]**



Q5) a) What must be the length of a 5mm diameter aluminium wire so that it can be twisted through I complete revolution without exceeding a shear of 42N/mm². Take, G=27 GPa. **[8]**

b) A closed cylinder 600mm diameter and 2 m long has shell thickness of 12 mm. It carries a fluid under pressure at 3 MPa. Calculate the longitudinal and hoop stress in the drum wall. Also determine the change in length, change in diameter and change in volume of the drum. Assume $E=2\times10^5$ MPa and Poisson ration of 0.3. **[10]**

OR

Q6) a) A cylindrical compressed air drum is 2 m in diameter with plates 12.5 mm thick. The efficiencies of the longitudinal and circumferential joints ane 85% and 45% respectively. If the tensile stress in the plating is to be limited to 100 MN/m^2, find the maximum safe air pressure. **[10]**

b) A cylindrical boiler is 2.5 m in diameter and 20 mm in thickness and it carries steam at a pressure of 1.0 N/mm^2: Find the stresses in the shell.**[8]**

Q7) a) A beam of length 5 m and of uniform rectangular section is simply supported at its ends. It carries a uniformly distributed load of 9 KN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 N/mm^2 and central deflection is not to exceed 1 cm. **[9]**

b) A cantilever of length 3 m is carrying a point load of 25 KN at the free end. If moment of inertia = 108 mm^4 and E = 2.1×10^5 N/mm^2 find the slope and deflection at the free end. **[9]**

OR

Q8) a) A cantilever of length 2.5 m carries a uniformly distributed load of 16.4 KN per meter length. If moment of inertia = 7.95×10^7 mm^4 and E = 2×10^5 N/mm^2, determine the deflection at the free end. **[9]**

b) A cantilever of length 3 m carries a uniformly distributed load over the entire length. If the deflection at the free end is 40 mm, find the slope at the free end. **[9]**