Total No. of Questions : 8]

SEAT No. :

PE-4325

[Total No. of Pages : 4

[6582]-98

S.E. (Production/Production & Industrial/Robotics & Automation / Production Sandwich)

STRENGTH OF MATERIAL

(2019 Pattern) (Semester - III) (211082)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***AnswerQ.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or 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 $\frac{M}{I}=\frac{\sigma}{y}=\frac{E}{R}$. 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]**

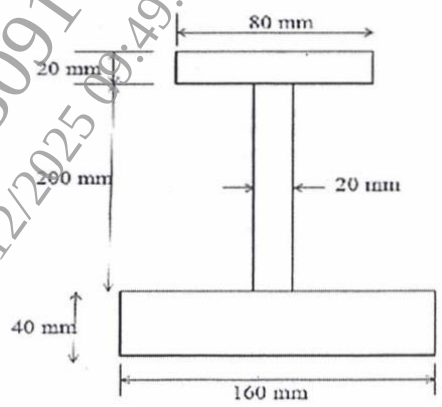
c) Calculate the maximum stress induced in the cast iron pipe of external diameter 40 mm, internal diameter 20 mm and of length 4 m, if it is supported at its ends and carries a point load of 80N at centre. **[7]**

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]**

P.T.O.

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) A solid vertical steel bar of equilateral triangular section of side 20mm is firmly fixed at the top. A rigid collar is attached at the lower end at distance of 600mm from the top. Calculate the strain energy stored in each of the following cases. **[9]**

i) When pull of 10 KN is applied gradually

ii) When a force of 8 KN is suddenly applied

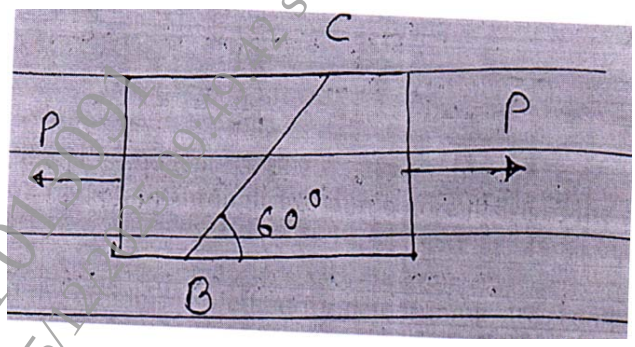
iii) When a weight of 4 KN falls through 120mm before it strikes the collar. Take E = 2 × 10^5 MPa.

OR

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

b) The principal tensile stresses at a point across two perpendicular planes are 100 MPa and 50 MPa. Find the normal and tangential stresses and the resultant stress and its obliquity on a plane at 20° with the major principal plane. **[8]**

c) A rectangular bar of Crossectional area of 1,1000 mm^2 is subjected to tensile load Path permissible normal and shear stress on obliue 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 150KW power at 180rpm **[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 50N/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 s 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 20mm 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 × 20 cm and of length 5 m 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 200 mm 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]**

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