SE Auto / Sem III / Choice Based / Second Half 2018

Paper / Subject Code: 50403 / STRENGTH OF MATERIALS 04/12/2018

Time: 3 Hours **Total Marks: 80**

N:B

- Q1 is compulsory answer any three from remaining.
- Assume suitable data wherever required.
- State the assumptions and justify the same.
- Write legibly with blue or black ink pen. Use pencil only to draw diagrams and graphs.

I Answer any four from the following.

a. A bar of 20 mm diameter is subjected to a pull of 50 kN. The measured extension over a gauge length of 20cm is 0.1 mm and the change in diameter is 0.0035mm calculate the Poisson's ratio and modulus of elasticity. **[5]**

b. A short column200mm x 100mm is subjected to an eccentric load of 60 kN at an eccentricity of 40 mm in the plane bisecting the 100 mm side .find maximum and minimum intensities of stresses at the base. **[5]**

c. A M.S. plate is 400 mm long 200mm wide and 50mm thick is subjected to gradually tensile load 1200 kN calculate i)proof resilience ii) modulus of resilience take $E=200\times10^3$ MPa. **[5]**

d. State torsion formula explain meaning of each term. Also state Assumptions made in theory of torsion. **[5]**

e. A cantilever beam 4m span carrying udl of 5kN/m and permissible bending stress in the material of beam is $15N/mm^2$. Design the section of beam if depth to width ratio is 2. **[5]**

f. State Assumption made in theory of bending also state bending formula. **[5]**

II a.A wagon weighing 35 kN is attached to a wire rope and moving down an incline plane at speed of 3.6 kmph. When the rope jams and wagon is suddenly brought to rest. If the length of rope is 60 m. at the time sudden stoppage. Calculate the maximum instantaneous stress and maximum instantaneous elongation produced . diameter of rope is 40mm. take $E=2.1\times10^5 N/mm^2$ **[10]**

b.A compound tube consist of a steel tube of 140mm ID and 160 mm OD and an outer brass tube of 160mm ID and 180mm OD. Both the tube are 1.5 m in length. If the compound tube carries an axial compressive load of 900 kN. find its reduction in length also find stresses and the load carried by each tube .E_s= 200 GN/m^2 $E_b=1\times10^5 N/mm^2$. **[10]**

III.a At a certain point in a strained material, σ_x= 100 MPa (T), ,σ_y=40 MPa (C), and shear stress τ=30MPa. Locate the principle planes and evaluate the principal stresses Also find the maximum shear stress and the plane carrying it . Use Mohr's circle method. **[10]**

b. Draw SF and BM diagram for beam shown with B as internal hinge. **[10]**

IV.a.A hollow shaft of diameter ratio 3/8(d_i to d_o) is to transmit 375 KW power at 100 rpm, the maximum torque being 20% greater than the mean .the shear stress is not to exceed than 60 N/mm^2 and

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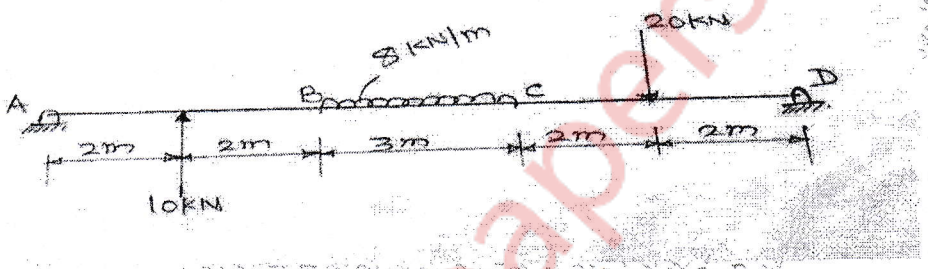
twist in a length of 4 m not to exceed 2°, calculate its external and internal diameter which would satisfy both the above condition take $G=0.85x10^5 N/mm^2$. [10]

b.A cylindrical shell one meter in diameter and 3 m long has a thickness of 10 mm if it is subjected to an internal pressure of $3N/mm^2$. Calculate change in length, change in diameter, change in volume. Take $E=210kN/mm^2$ and $\mu=0.3$ [10]

V.a. Find the stresses in the wires of the system made of two copper wire and one steel wire of equal length &65 mm^2cross sectional area the load of 18 kN is attached to it. The temperature of the system rises by 10°C assume $\alpha_c=16x10^{-6}/°C$, $E_c=110kN/mm^2$

$\alpha_s=12x10^{-6}/°C$, $E_s=210kN/mm^2$ [10]

b.Determine the deflection at B and slope at D for simply supported beam as shown. Also find the max.deflection and its location take E= 200 GN/m^2 and $I=300x10^8 mm^4$. [10]



VI.a. A hollow cylindrical CI column is 4 m long with both ends fixed . determine the minimum diameter of the column . if it has to carry a safe load of 250kN with a FOS of 5. Take internal diameter as 0.8 times the external diameter E= 200 GN/m^2. [10]

b.A simply supported beam of length 3m and cross section of 100mm x 200mm carrying a udl of 4kN/m neglecting the weight of beam find :

i)Max,bending stress in the beam.

ii)Max.shear stress in the beam

iii) The shear stress at a point 1 m to the right of the left support and 25 mm below the top surface of beam. [10]
