B.E. (Civil Engineering) Third Semester (C.B.S.)

Strength of Materials

P. Pages : 3 **TKN/KS/16/7296**

Time : Three Hours * 0 9 2 2 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Assume suitable data whenever necessary.
3. Illustrate your answers whenever necessary with the help of neat sketches.
4. Use of non programmable calculator is permitted.

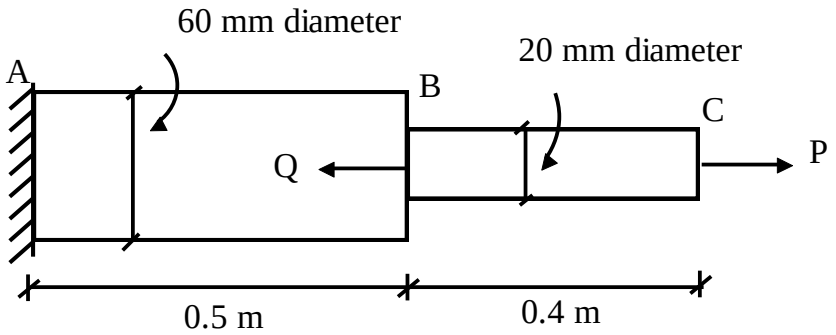
1. a) Define Poisson's ratio and state the relation between three elastic constants E, G and K. **8**

b) A 9 kN tensile load will be applied to a 50m length of steel wire with E = 200 GPa. Determine the smallest diameter of wire which can be used, knowing that the normal stress must not exceed 150 MPa and that the increase in the length of the wire should be at most 25 mm. **6**

OR

2. a) Draw stress – strain curve for mild steel under tension and explain the salient points. **6**

b) The rod ABC is made of an aluminium for which E = 70 GPa knowing that P = 6 kN, Q = 42 kN. Determine the deflection of (i) Point A (ii) Point B. **8**



3. a) Write properties of shear force diagram. **3**

b) Write properties of Bending Moment diagram. **3**

c) Derive the relationship between load, shear force and bending moment. **7**

OR

4. A beam 10m long has supports at its end A & B. It carries a point load of 2.5 kN at 3m from A and a point load of 2.5 kN at 7m from A and UDL of 0.5 kN/m between the point loads. Draw SFD and BMD. Locate the maximum B.M. Value. **13**

5. a) Derive the bending formula and give the three assumption in theory of simple bending. **7**

b) A hollow circular bar having outside diameter twice the inside diameter is used as a beam. From the bending moment diagram of the beam, it is found that the bar is subjected to a bending moment of 40 kN.m. If the allowable bending stress in the beam in to be limited to 100 MN/m^2. Find the inside diameter of the bar. **6**

OR

6. a) A beam of square section is used as a beam with one diagonal horizontal. Find the magnitude and location of maximum shear stress in beam. Sketch the shear stress distribution across the section. **9**

b) Draw a typical shear stress distribution over following beam section subjected to a shear force. **4**

i) I – Beam

ii) T – Beam

7. a) Determine the torque which may be applied to a solid shaft of 90mm outer diameter without exceeding an allowable shearing stress 75 MPa. **6**

b) Solve part (a) assuming that the solid shaft is replaced by a hollow shaft of the same mass and of 90 mm inner diameter. **7**

OR

8. a) A bar of rectangular section 50 mm x 25 mm in section is 600 mm long and is subjected to a torque of 275 N – m. **6**

Find the maximum shear stress induced and the angle of twist Take $C = 8 \times 10^4 \ N/mm^2$.

b) A hollow shaft is to transmit 300 kN at 80 r.p.m. If the shear stress is not to exceed $60\,N/mm^2$ and the internal diameter is 0.6 of the external diameter. Find the external and internal diameter assuming the maximum torque is 1.4 times the mean torque. **7**

9. a) Derive the differential equation of flexural of beam. **8**

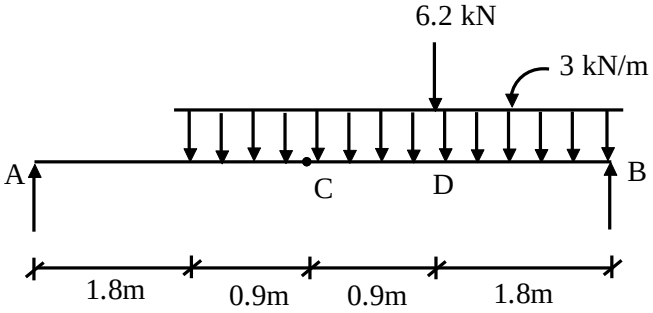
b) Find the deflection of cantilever beam loaded with concentrated load at free end. **6**

OR

10. For the beam shown in figure **14**
Determine :

a) Slope at the end A

b) Deflection at the mid point C.



11. a) Derive the differential equation of equilibrium under the body forces for state of stress in a two dimension for a strained material. **7**

b) Define the following terms. **6**

i) Principal Plane

ii) Principal Stresses

iii) Angle of Obliquity

OR

12. At a point in a strained material there are two mutually perpendicular stresses of $600\,N/mm^2$ and $400\,N/mm^2$ both tensile. They are accompanied by a shear stress of $100\,N/mm^2$. **13**

Find :

i) Principal stresses

ii) Position of principal planes.

iii) Maximum shear stress.

Compare the values using Mohr circle method.

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