NTK/KW/15 – 7296

Third Semester B. E. (Civil Engineering) (CBS) Examination

STRENGTH OF MATERIAL

Time : Three Hours] [Max. Marks : 80

N. B. : (1) All questions are compulsory and carry marks as indicated.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Use of Non–programmable pocket calculator is permitted.

1. (a) Derive the equation for elongation of bar of uniformaly tapering section. 4

(b) A bar show in fig. 1 is subjected to tensile force of 200 KN at each end.

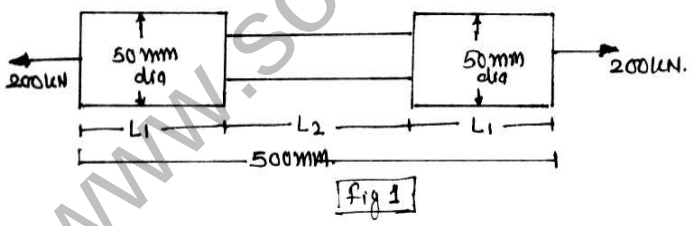


fig 1

Find :

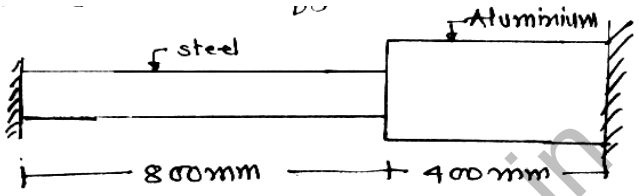
(i) The diameter of middle portion if the stress in the middle portion is limited to 150 N/mm^2 5

(ii) The length of the individual portion if the total elongation of the bar is limited to 0.30 mm
Take E = 200 kN/mm^2 5

OR

2. (a) A thin cylindrical pressure vessel of diameter 2.5 m and thickness 18 mm is subjected to an internal pressure of 1.2 N/mm^2. Find principal stresses. 4

(b) The composite bar consisting of steel and aluminium components shown in fig. 2



is connected to two grips at the ends at a temperature of 60^{0}C. Find the stresses in the two rods when the temperature falls to 20^{0}C.

(1) If the ends do not yield. 5

(2) If the ends yield by 0.25 mm

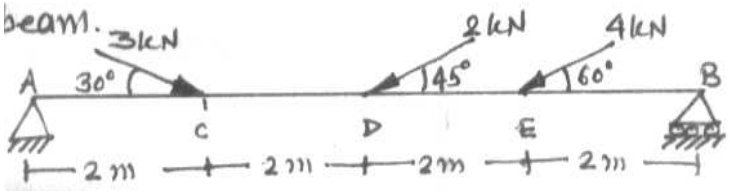
Take $E_s = 2 \times 10^5$ N/mm^2: $E_a = 0.70 \times 10^5$ N/mm^2

$\alpha_s = 1.17 \times 10^{-5}$ per^0/C: $\alpha_a = 2.34 \times 10^{-5}$ per^0/C

$A_s = 250$ mm^2 : $A_0 = 375$ mm^2 5

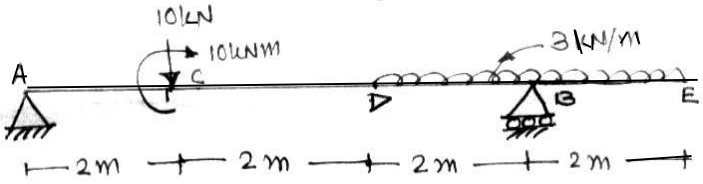
3. (a) Draw SFD and BMD for simply supported beam subjected to uniformly distributed Load of intensity w in kn/m through out the span. 4

(b) Construct the axial thrust and SF diagram for the Loaded beam.



OR

4. Construct the SF and BM diagram for the Loaded beam



13

5. A bar of T section symmetrical about the vertical centre line has a 160 mm wide and 20 mm thick flange and a 120 mm deep and 20 mm thick web. The member is acted upon by a longitudinal pull P which acts on the section at a point on the vertical central line and is 50 mm from the bottom edge of the web. Determine the magnitude of the max^{m} pull which can be applied if the maximum allowable tensile stress on the section is 80 MPa. Also find the minium stress on the section when the pull P is transmitted. 13

OR

6. Derive bending stress formulae for a beam subjected to transverse loading with suitable assumption. 13

7. Derive torsional formulae with suitable assumption for circular cross section. 13

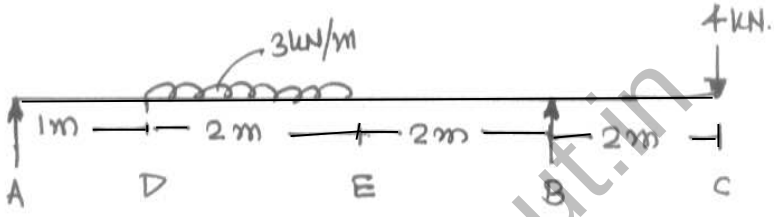
OR

8. A solid shaft transmits 100 kW at 150 rpm. Determine the suitable diameter of the shaft if the maximum torque transmitted exceeds. the mean by 20% in each revolution. The shear stress is not to exceed 60 MPa. Also find the maximum angle of twist in a length of 4m of the shaft. G=80 GPa. 13

9. A simply supported beam of 8 m length carries two point Loads of 64 kN and 48 kN at 1 m and 4 m respectively from the left hand end.
Find the deflection under each Load and the maximum deflection $E = 210$ GPa and $I = 180 \times 10^{-6}$ mm^4. 13

OR

10. An overhanging beam ABC. Supported at A and B is Loaded as shown in fig.



Determine the deflection at the free end and maximum deflection between A and B. Take $I = 600$ cm^4 and $E = 210$ GPa. 13

11. The principal stresses at a point in a bar are 200N/mm^2 (Tensile) and 100 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60^0 to the axis of the major principal stress. Also determine. The maximum intensity of shear stress in the material at the point. 14

OR

12. At a point in a piece of elastic material the normal stresses on two mutually perpendicular planes are 80 N/mm^2 (Tensile) and 60 N/mm^2 (compressive). These planes also carry shear stress of 65 N/mm^2. Determine the principal plane, principal stress and maximum shear stress. 14