24763

B. Tech (FT) 4th Semester F. Scheme Examination,

May–2015

STRENGTH OF MATERIALS

Paper–FT–206–F

Time allowed : 3 hours] *[Maximum marks : 100*

Note : ***Question No. 1 is compulsory*** *and short answers type. Each question carries equal marks (20 marks). Students have to attempt* ***five*** *questions in total at least* ***one*** *question from each section.*

1. (a) Define Poisson's ratio.

(b) Define Elastic body and Plastic body.

(c) Explain the use of Factor of safety.

(d) Define principal planes and principal stresses.

(e) Write down the relation between shear force, bending moment and udl.

(f) Write down the torsion equation.

(g) State the assumptions used in theory of bending.

(h) What is difference between struts and column ?

(i) Write down the Rankine Gordon's formula for crippling load.

(j) What is the deflection at the free end of cantilever beam, when it carries a point load at its free end ? 10×2=20

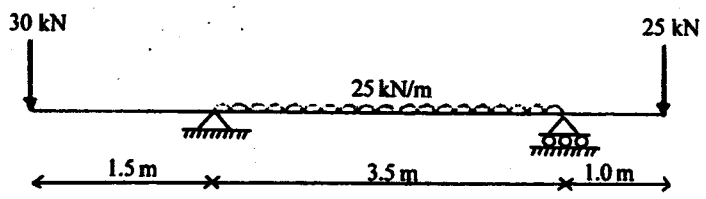
Section–A

2. A compound tube consists of a steel tube 140 mm internal diameter and 160 mm external diameter and an outer brass tube 160 mm internal diameter and 180 mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 900 kN. Find the stresses and the load carried by each tube and the amount it shortens. Length of each tube is 140 mm. Take E for steel as 2×10^5 N/mm^2 and for brass as 1×10^5 N/mm^2. 20

3. At a point in an elastic material, a direct tensile stress of 60 N/mm^2 and a direct compressive stress of 40 N/mm^2 are applied on planes at right angles to each other. If the maximum principal stress is limited to 75 N/mm^2 (tensile), find the shear stress that may be allowed on the planes. Also determine the minimum principal stress and the maximum shear stress. 20

Section–B

4. Draw the shear force and bending moment diagrams for a beam supported and loaded as shown in figure 1. Locate the salient points.



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5. (a) Derive the torsion equation and state the assumption used. 10

(b) A hollow shaft is subjected to a torque of 50 kNm and Bending moment of 40 kNm. The internal diameter of the shaft is half the external diameter. If the maximum Shear stress is not to exceed 80 N/mm^2, find the diameter. 10

Section–C

6. (a) A cantilever beam of a building having span of 3m is subjected to a udl of 20 kN/m over entire span. Determine the maximum bending stresses if the c/s of beam is 200 mm × 400 mm. Take E = 1.4 GPa. 10

(b) A beam having hollow rectangular section with outer and inner dimensions of 250 mm × 250 mm and 150 mm × 150 mm respectively is subjected to a shear force of 180 kN. Calculate the ratio of maximum to average shear stress.

7. (a) Write the assumptions and limitations made in Euler's theory. 10

(b) A built up I-Section has an overall depth of 400 mm, width of flanges 300 mm, thickness of flanges 50 mm and web thickness 30 mm. It is

used as a beam with simply supported ends it deflects by 10 mm when subjected to a load of 40 kN/m length. Find the safe load if this I-Section is used as a column with both ends hinged. Use Euler's formula. Assume a factor of safety 1.75 and take $E = 105\ N/mm^2$.

Section–D

8. Determine the maximum deflection y and slope in a simply supported beam of length 16 m carrying a concentrated load of P at 5m from right hand side and beam is also carrying a uniformly distributed load of 8 kN/m for the entire span. 20

9. Prove that for a fixed beam :

(i) Area of B. M. diagram due to vertical loads is equal to the area of B. M. diagram due to end moments.

(ii) Distance of C. G. of B. M. diagram due to vertical loads is equal to the distance of C. G. of B. M. diagram due to end moment from the same point. 20