VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA
MID-SEMESTER EXAMINATION, March-2016

Structural Mechanics II
[redacted] 4th Semester (B. Architecture)

Time: **2.00** hours

Full marks: 20

Answer any four questions (Question No. 1 is compulsory)

1. (i) What is section modulus? (1x5)

(ii) State any two assumptions made in the theory of simple bending.

(iii) What is pure bending?

(iv) A steel wire 5mm diameter is bent into a circular shape of 5mm radius. Determine the maximum stress induced in the wire. Take E= 200GPa.

(v) What is the section modulus and moment of resistance of a rectangular section having width (b) and depth (d)?

2. (a) A cast iron cantilever of length 1.5 m fails when a load of 1920 N is applied at the free end. Determine the stress at failure if the section of the cantilever is 40mm x 60mm. (2.5)

(b) Prove the relations (2.5)

$$\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$$

Where M = Bending moment
I = Moment of inertia
f = Bending stress
E = Young's modulus
R = Radius of curvature

3. (a) What is the section modulus of a circular section of diameter (d)? A beam 20mm x 20mm in section and 1m long supported at the ends fails when a central load of 640 N is applied. Determine the stress at failure. (2.5)

(b) What is the maximum and average shear stress for a rectangular section? A rectangular section 100mm wide is subjected to a maximum shear force of 50,000N.The corresponding maximum shear stress being $3N/mm^2$. Find the depth of the beam. (2.5)

4. (a) Derive an expression for shear stress. (2.5)

(b) A vertical pole consisting of a circular tube of external diameter 100mm and internal diameter 80mm is loaded by a horizontal force P = 6000N. Find the maximum shear stress. (2.5)

5. (a) The T- shaped cross- section of a beam shown in fig. 1 is subjected to a vertical shear force of 100 KN. Calculate the shear stress at the neutral axis and at the junction of the web and flange. Moment of inertia about the horizontal neutral axis is $1.134 \times 10^8 mm^4$. (2.5)

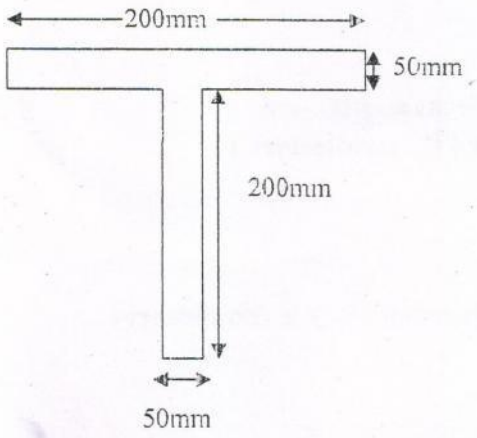

fig. 1

(b) A beam of triangular cross- section having a base width of 100mm and height 150mm is subjected to a shear force of 13.5 KN. Find the value of maximum and average shear stress. (2.5)

6. (a) A timber beam 100mm wide and 150 mm deep supports a uniformly distributed load over a span of 2m. If the safe stress is $28N/mm^2$ in bending, calculate the maximum load which can be supported by the beam. (2.5)

(b) A I- beam of span 2.2m simply supported at the ends, carries a central load W. The beam section has an overall depth of 290mm with horizontal flanges each 150mm x 20mm and vertical web of 250mm x 10mm. If the maximum shear stress is to be $45 N/mm^2$, the maximum bending stress is $150 N/mm^2$, calculate the value of centrally applied point load W. (2.5)