Code : C-301

Register Number				C	D	6	4

III Semester Diploma Examination April/May 2008

CIVIL ENGINEERING BOARD

STRENGTH OF MATERIALS

Time : 3 Hours] **[Max. Marks : 100**

Instructions : (1) Section – I is compulsory.

(2) Answer any **two** full questions each from Section – II, III and IV.

SECTION – I

1. (a) Fill in the blanks with appropriate word/words : **1 × 5 = 5**

(i) The maximum strain energy per unit volume is known as _____.

(ii) Inverse of Poisson's ratio is always _____ than one.

(iii) Bending stress is zero at _____.

(iv) The line of intersection of the neutral layer with any normal section of the beam is called the _____ of that section.

(v) Torsion induces _____ stress in the shaft.

(b) Explain the stress-strain diagram for a M.S. material. subjected to a gradually applied tensile load. 5

SECTION – II

2. (a) A load of 2500 N is to be lifted by a steel wire. Determine the diameter of the wire so that the stress may not exceed 100 N/mm^2. Also determine the elongation over a length of 5 m. Take E = 2 × 10^5 N/mm^2. 7

(b) A square bar of steel of hollow cross section has internal dimension 20 mm × 20 mm and of uniform thickness 5 mm is subjected to a tensile load of 50 kN. If the length of the bar is 1 m long and modulus of elasticity of steel is 2 × 10^5 N/mm^2. 8

Calculate :

(i) Stress (ii) Strain (iii) Elongation

3. (a) A steel rod is 20 m long at 20 °C. Find the expansion of the rod when the temperature is raised to 70 °C. Find the temperature stress in the rod 6

When the rod is permitted to expand 6 mm

Take $\alpha_S = 12 \times 10^{-6}$ /°C

$E_S = 200$ kN/mm^2

(b) A bar is 20 mm in diameter and 1 m. long. Calculate the modulus of rigidity and bulk modulus if modulus of elasticity of the material is 1×10^5 N/mm^2. Also find the change in volume when the bar is subjected to an intensity of pressure of 100 N/mm^2. Longitudinal strain is 4 times the lateral strain. 9

4. (a) At a point in a strained material the principal stresses are 120 MPa (tensile) and 80 MPa (compressive). Determine the normal stress, shear stress and resultant stress on a plane inclined at 45° to the axis of major principal stress. Also determine the maximum shear stress at the point. 7

(b) An axial pull of 40000 N is suddenly applied to a steel rod 2 m long 1000 mm^2 in cross section. Calculate the strain energy stored. Take E is 2×10^5 N/mm^2. 8

SECTION – III

5. (a) An I section consists of top flange 50 mm × 20 mm, bottom flange 100 mm × 15 mm and web 10 mm × 240 mm. Find the M.I. of the section about their centroidal axes. 10

(b) What are the assumptions made in the theory of simple bending ? 5

6. (a) A simply supported beam of gm span carries point loads of 10 kN and 20 kN at 2 m & 5 m respectively from the left support. In addition it also carries a u.d.l. of 10 kN/m for 3 m starting from the right support. Draw SFD & BMD. 10

(b) A rectangular beam 300 mm deep is simply supported over a span of 4 m. What uniformly distributed load per metre the beam may carry if the bending stress is not to exceed 120 N/mm^2 ? 5

Take $I = 8 \times 10^6$ mm^4

7. (a) A cantilever beam of span 5 m carries point loads of 3 kN at its free end and 6 kN at 1 m from free end. Draw BMD & SFD. 7

(b) A timber cantilever beam 200 mm wide & 300 mm deep 3 m long is loaded with a u.d.l. of 3000 N/m over the entire span. What concentrated load is to be placed at the free end of the cantilever of the stress is not to exceed 7.2 N/mm^2. **8**

SECTION – IV

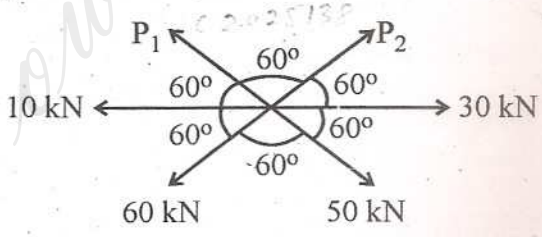
8. (a) State the assumptions made in the theory of pure Torsion. **5**

(b) Design a suitable dia. for a circular shaft required to transmit 90 kN at 180 rpm. The shear stress in the shaft is limited to 70 N/mm^2 and max. torque exceed the mean by 40%. Also calculate the angle of twist in a length of 2 m. Take $C = 0.9 \times 10^5$ N/mm^2. **10**

9. (a) Define welded joint and write three advantages. **5**

(b) A single riveted double cover butt joint in a structure it is used for connecting two plates 12 mm thick. The diameter of the rivets is 24 mm. The permissible stresses are 120 N/mm^2 in tension, 100 N/mm^2 in single shear, 200 N/mm^2 in double shear and in bearing. Calculate the necessary pitch and efficiency of the joint. **10**

10. (a) Six strings are tied at a point are pulled in directions equally spaces from one another as shown in fig. Find the magnitude of the pulls P_1 & P_2 so that they are in equilibrium. **5**



(b) Find the reactions of supports of the beam as shown in Fig. **10**