Code : C-301

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Third Semester Diploma (Annual) Examination, 2007

CIVIL ENGINEERING BOARD

STRENGTH OF MATERIALS

(AT, ME, MP and MY)

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

Note : (1) Section-I is compulsory.

(2) Answer any **two** full questions each from Section-II and Section-III and any **one** full question each from Section-IV and Section -V.

SECTION – I

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

(i) The ratio of shear stress to shear strain is known as _____.

(ii) The point through which the whole weight of the body acts is known as_____.

(iii) A beam fixed at one end and free at the other end is known as _____beam.

(iv) At the neutral axis the value of compressive stress and tensile stress is_____.

(v) Due to the torque every cross section of the shaft is subjected to some_____stress.

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

SECTION – II

2. (a) A steel rod 500mm long 20mm dia is subjected to an axial tensile load of 50 kN. Determine (1) Stress (2) Strain (3) Elongation (4) Lateral strain. (5) Change in diameter. $E_s = 2 \times 10^5$ N/mm^2; 1/m=0.25. **8**

(b) A bar 300mm is made of two portions. The top having a dia of 50mm. It is subjected to a tensile load of 152 kN. Find the diameter of the bottom portion if the stress there should not exceed 140 N/mm^2. Find also the length of the bottom portion if the total elongation of the bar is 0.16mm. $E = 2 \times 10^5$ N/mm^2. **7**

3. (a) A bar 30 mm dia is subjected to a pull of 60 kN. The measured extension on a gauge length of 200 mm is 0.09 mm and the change in dia is 0.0039 mm. Calculate the poisons ratio and the values of three modulli. 8

(b) Steel rod 20 mm dia and 6 m long is connected to two grips at each end at a temperature of 120°. Find the pull exerted when the temperature falls to 40 °C. (i) if the ends do not yield (ii) if the ends yield by 1.1 mm. $E = 2 \times 10^5$ N/mm^2. $\alpha = 12 \times 10^{-6}$ /°C. 7

4. (a) An axial pull of 50 kN is suddenly applied to a steel rod of 2m long 40 mm dia. Calculate the stress produced & strain energy that can be stored if $E = 200$ kN/mm^2. 4

(b) A steel punch can be worked to a compressive stress of 800 kN/mm^2. Find the least diameter of the hole which can be punched through a steel plate of 10 mm thick if its ultimate shear strength is 350 kN/mm^2 4

(c) At a point in a strained material the principal stresses are 100 N/mm^2 (tensile) and 60 N/mm^2 (compressive). Calculate the normal stress, tangential stress and resultant stress on a plane inclined at 30° with the axis of minor principal stress. 7

SECTION – III

5. (a) The moment of inertia of a rectangular section about x-x and y-y axis passing through centre of gravity are 27×10^7 and 432×10^5 mm^4. Find the size of the section. 7

(b) A simply supported beam 6m span is carrying a udl of 20 kN/m over a length of 3m from the right support. Draw S.F.D and B.M.D. Also calculate the maximum BM. 8

6. (a) A 10 m long beam having a span of 8 m is overhanging on the right side by 2m. A point load of 200 N is acting at 2 m and another point load of 200N at 6 m from the left end. In addition another point load of 200 N is acting at the free end of overhang. Draw B.M. & S.F. Also find the point of centraflexure. Indicate the values of max. B.M. & S.F. 10

(b) Locate the centre of gravity of an equal angle section 100mm × 100mm × 10mm. 5

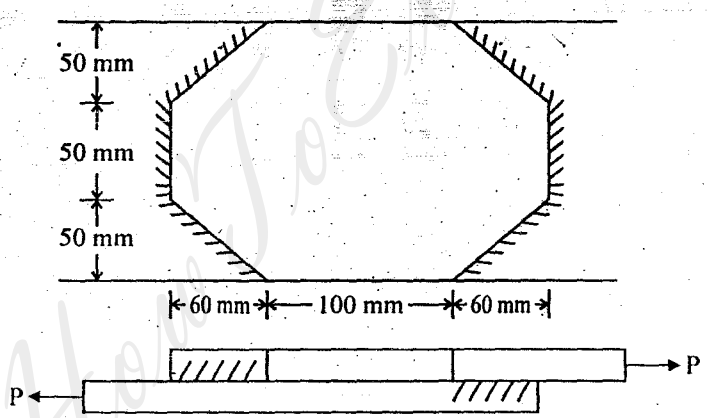
7. (a) Find the dimensions of timber foist. Span 6m to carry a brick wall 225mm, 3 m high. The weight of the brick is 20 kN/m^3 and the maximum permissible stress is limited to 8 N/ m^2. The depth of the foist is to be twice its width. 8

(b) A shaft has to transmit 105 kN at 160 rpm. If the shear stress is not to exceed 65 N/mm^2 and the twist is a length of 7.35 m must not exceed 1°. Find the suitable dia. C = 8 ×10^4 N/mm^2 7

SECTION – IV

8. (a) Two plates 10mm thickness are to be connected in a double riveted butt joint 20 mm rivet at a pitch of 75mm of the ultimate tensile, shearing and bearing stress are 460 N/mm^2 320 N/mm^2 and 640 N/mm^2 respectively. Find the pull per pitch length the joint will fail. Find also the efficiency of the joint. 7

(b) A welded joint is provided to connect two tie bars 150 mm ×10 mm as shown in the figure. The working stress in the bar is 150 N/mm^2. Size of the fillet weld is 8 mm. Safe stress for the weld is 102.5 N/mm^2 Investigate the design. 7



(c) Discuss the failure of riveted joints. 4

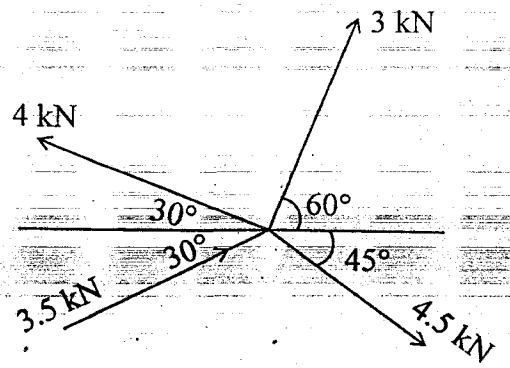
9. (a) A thick metallic cylindrical shell of 150 mm internal dia is required to withstand an internal pressure of 8N/mm^2. Find the necessary thickness of the shell if the permissible tensile stress is 20 N/mm^2. 7

(b) A vertical thin walled stand pipe is 4.8 m in dia and stands 30 m high. If the allowable working stress in tension is 120 N/mm^2 . What is the required wall thickness of the pipe ? Assume that the pipe is filled with water of specific weight 10 kN/m^3. 7

(c) Differentiate between circumferential stress and longitudinal stress. 4

SECTION – V

10 (a) Find graphically the resultant of the coplanar concurrent force system shown in the figure. What is the value of the resultant ? **12**



11) Simply supported beam of span 6 m has udl of 10 kN/m run over 2 m from the left support. In addition there are two point loads of 20 kN each at 2m and 3.5 m from the right support. Determine graphically the support reactions. **12**