Code : C 301-D

Register Number							
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Third Semester Diploma (Supplementary) Examination, 2006

CIVIL BOARD

STRENGTH OF MATERIALS

(Course Codes : AT, ME, MP, MY)

Time : 3 Hours] [Max. Marks : 100

Instructions : i) *Section I* is compulsory.

ii) Answer any *two* full questions each from *Sections II* and *III* & any *one* full question each from *Sections IV* & *V*.

SECTION - I

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

i) In a simply supported beam for any loading the B.M. at supports will always ..... .

ii) The Poisson ratio is always ..... unity.

iii) The polar modulus of a hollow shaft is ..... .

iv) The M.I. of circular section about its centroidal axis is ..... .

v) If p_1 and p_2 are principal stresses then maximum shear stress will be ..... .

b) Define the following : 5 × 1 = 5

i) Bulk modulus

ii) Moment of Inertia

iii) Thick cylinder

iv) Point of contraflexure

v) Moment of resistance.

SECTION - II

2. a) A cast iron column has an internal dia. of 200 mm. What should be the minimum external dia. so that it may carry a load of 1·6 MN without exceeding stress of 90 N/mm ^{2} ? 5

b) A mild steel bar of 25 mm dia. 200 m length has an extension of 0·15 mm under a load of 75 kN. Loaded elastic limit is 130 kN and the maximum

load is 250 kN. The total extension is 55 mm. Dia. at the fracture is 18·5 mm.

Find :

i) Young's modulus

ii) Maximum stress

iii) Percentage elongation

iv) Percentage reduction in area. 10

3. a) A steel bar 250 mm long, 50 mm × 50 mm in cross-section is subjected to a pull of 300 kN. Calculate the change in volume if 1/m = 0·25. Take $E = 2 \times 10^5$ N/mm^2. 9

b) Two parallel walls 10 m apart are stayed together by a steel rod of 50 mm dia. through metal plates & nuts at both ends. The nuts are tightened, when the rod is at a temperature of 150°C. Determine the stress in the rod when the temperature falls down to 50°C, if

i) the ends do not yield,

ii) the ends yield by an amount 10 mm.

Take $E = 200$ kN / mm^2

$\alpha = 0{\cdot}0000125/°C$. 6

4. a) A bar of 20 mm dia. is subjected to a pull of 38 kN. The measured extension on a gauge length of 200 mm is 0·12 mm and change in dia. is 0·0036 mm.

Calculate

i) Young's modulus

ii) Poisson's ratio

iii) Rigidity modulus

iv) Bulk modulus. 9

b) At a point in a strained material the principal stresses acting are 100 N/mm^2 & 60 N/mm^2 both tensile.

Find :

i) Normal stress

ii) Tangential stress

iii) Resultant stress,

of the plane is inclined at 60° to major axis. 6

SECTION - III

5. a) Draw the S.F.D and B.M.D. for a cantilever beam of 6 m long which carries a point load of 2 kN at the free end and a *u.d.l.* of 3 kN/m for a length of 2 m from the fixed end. 6

b) A simply supported beam of 8 m carries a *u.d.l.* of 5 kN/m for a length of 3 m from the left support and point loads of 6 kN, 5 kN & 4 kN at 4 m, 5 m and 6 m from the left support. Draw SFD & BMD. 9

6. a) Locate the centroid of an angle section ISA 100 mm × 80 mm × 10 mm with its longer leg vertical. 6

b) The top flange of an I-section is 60 mm × 20 mm, web 100 mm × 20 mm and the bottom flange is 100 mm × 20 mm. Find Moment of Inertia about its centroidal *XX* and *YY* axes. 9

7. a) A timber beam of rectangular cross-section is simply supported over a span of 6 m carrying a *u.d.l.* of 2 kN/m over entire span. Calculate the width and depth of beam if the stress is not to exceed 8 N/mm ^{2}.

Take ratio of depth to width as 2. 6

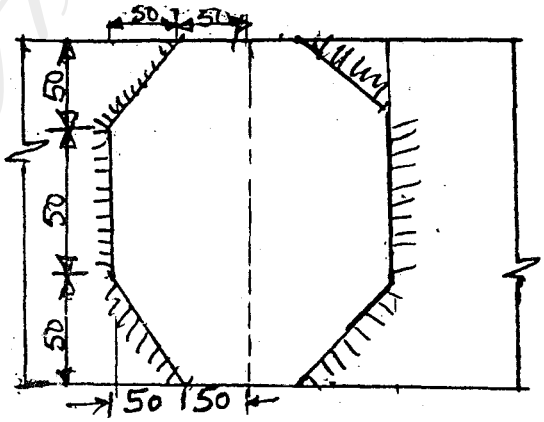
b) Select a suitable dia. of solid shaft of circular section to transmit 112·5 kN of power at 200 R.P.M., if the allowable shear stress is 75 N/mm ^{2} and the allowable twist is 1° in a length of 3 m.

Take $C = 0{\cdot}8 \times 10^5$ N/mm ^{2}. 9

SECTION - IV

8. a) Design a double riveted double cover butt joint to connect two plates 10 mm thick with 20 mm dia. rivets. Take $f_t = 90$ N/mm ^{2}, $f_s = 80$ N/mm ^{2}, $f_b = 180$ N/mm ^{2}. 9

b) A welded joint is provided two tie bars 150 mm × 100 mm as shown in *fig. 1*. The working stress in the tie bar is 120 N/mm ^{2}. Investigate the design, if the size of fillet weld is 12 mm. Take the working stress in the end fillet as 100 N/mm ^{2} and for diagonal fillet as 70 N/mm ^{2}. 9



ALL DIMENSIONS ARE IN mm

Fig. (1)

9. a) The dia. of riveted boiler is 2·5 m and is designed to withstand a pressure of 1 N/mm ^{2}. If the longitudinal efficiency is 70% and the efficiency of circumferential joint is 40%, determine the thickness of plates required. Take the stress in the plate as 150 N/mm ^{2}. 9

b) A thick cylindrical cell of 160 mm internal dia. is 45 mm thick. The cell is subjected to an internal pressure of 52·5 N/mm ^{2}. Find the maximum and minimum intensities of loop stress across the section. 9

SECTION - V

10. A beam of 10 m span simply supported at its ends, carries concentrated loads of 30 kN, 50 kN and 20 kN acting at 2 m, 5 m and 7 m from the left support respectively. Determine the reactions of supports graphically. 12

11. Five forces act an a rigid bar as shown in *fig. 2*. Find the value & position of resultant of these forces graphically. 12

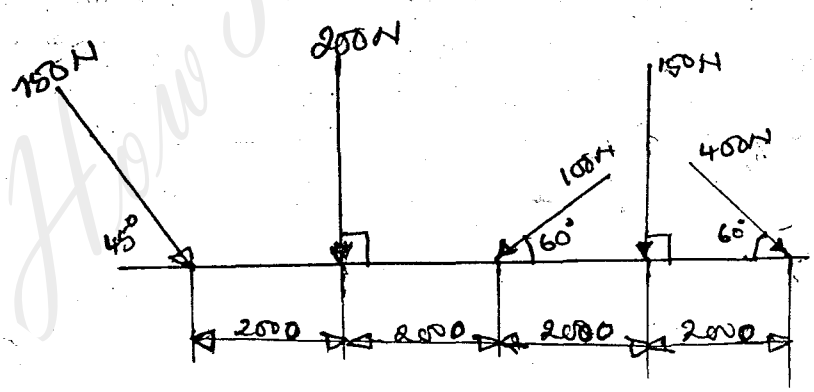


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Fig. (2)