



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH (CE) / SEM-5 / CE-505 / 2010-11

2010-11

STRUCTURAL DESIGN - II

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) Diameter of the rivet hole should be greater than the nominal diameter of a rivet by about

- | | |
|----------------|-----------------|
| a) 4 to 5 mm | b) 2.5 to 4 mm |
| c) 1.5 to 2 mm | d) 0 to 1.5 mm. |



- ii) The diameter of the rivet is d in mm and t is the minimum thickness of the plates to be jointed in mm may be obtained from the formula

- a) $d = 6\sqrt{t}$ b) $d = 6t$
 c) $d = 6t^2$ d) $d = 6t^3$.

- iii) The permissible bearing stress in power driven rivets should not exceed in N/mm^2 , where quality of steel Fe410 mild still and Yield stress $F_y = 250 \text{ MPa}$, is

- a) $1.2 F_y$ or 300 b) $0.4 F_y$ or 100
 c) $0.66 F_y$ or 165 d) $0.6 F_y$ or 150.

- iv) In welding, the temperature is raised to the level of melting point of steel for fusion around

- a) $1,000^\circ \text{C}$ to $1,200^\circ \text{C}$ b) $1,450^\circ \text{C}$ to $1,500^\circ \text{C}$
 c) 500°C to 750°C d) $3,000^\circ \text{C}$ to $3,500^\circ \text{C}$.

- v) A compression member is known as

- a) Tie b) Column or strut
 c) Beam-column d) Beam.

- 5406



- x) The column bases of industrial buildings are subjected to
- Bending and compression forces
 - Tension and compression forces
 - Bearing and compression forces
 - Bearding and torsional forces.
- xi) The maximum slenderness ratio permissible in steel ties which may be subjected to compression under wind load condition should be
- 250
 - 350
 - 450
 - no limit.
- xii) The least radius of gyration (r) of a batten or a lacing bar whose thickness is t and width is b is equal to
- $bt^3 / 12$
 - $bt^2 / 6$
 - $\frac{t}{\sqrt{12}}$
 - $bt^3 / 3.$
- xiii) In Gantry girder the lateral force is resisted by
- web only
 - compression flange and web
 - compression flange
 - whole section.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Describe the modes of failure of riveted joint.
3. a) State the assumptions in the theory of riveted joints.
b) Compare riveted joint with welded joint.
4. What are the advantages and disadvantages of welded joint ?
5. Design a lap joint for two plates of size 100 mm × 12 mm and 100 mm × 8 mm. The permissible stresses for plates in tension and weld are 150 MPa and 108 MPa respectively.
6. Calculate the strength of ISA 75 50 10 mm thick, when used as a tension member with its longer leg connected by –
 - i) 18 mm diameter rivet
 - ii) fillet weld.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. A beam freely supported of 12 m span with two concentrated load 19.6 T each at 1/3rd distance from end support & the self load of beam is 200 kg/m, made up of I section ISMB 600×122.6 kg/m with top plates in flange. Considering a safe design with the calculation of curtailment of top plate.



8. A column section ISC 200 is the support an axial compression load of 700 kN & a moment of 55 kNm. Design column slab base, assuming bearing column end to be milled. The allowable bearing stress for concrete in footing is 3.75 MPa, yield stress F_y of steel is 250 MPa. Also design the welded connection between column & the base slab. T for the column flange is 15 mm. Draw a sketch giving the structural details. (Take strength of 1 mm fillet weld / mm length as 76N; $F_{bt} = 0.75 F_y$; $V = 0.25$)
9. In an industrial shed an edge support consisting of 2L-110×110 mm is to be connected to a 16 mm gusset plate for a tensile load of 650 kN. Design the moment free welded connection. The distances of centroid of angle from the backside of legs are $C_x = C_y = 30.9$ mm. The strength of weld per mm thickness per mm length is 76 MPa.
10. Determine the maximum load in the rivets of the eccentric connection as shown in Fig.-1.

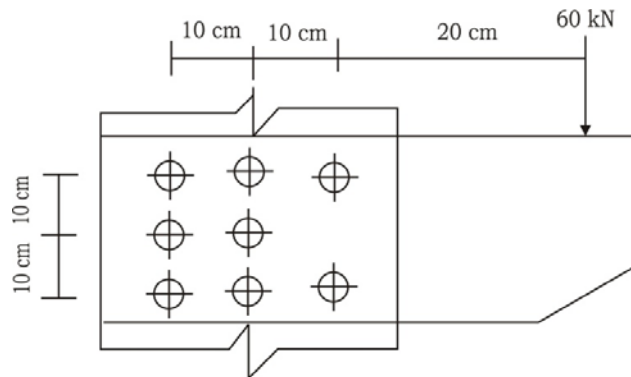
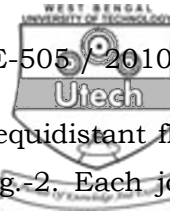


Fig. 1



11. Design a main floor beam supporting three equidistant floor joints over a span of 10 m as shown in Fig. 2. Each joint provides restraint to main beam & transmits a load of 60 kN of the beam.

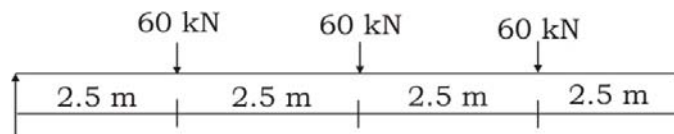


Fig. 2

12. A tie in a truss consists of pair of angles ISA 90×60×10 mm ($a=14.01 \text{ cm}^2$) welded on either side of a gusset plate 12 mm thick through the longer legs. Design the welded joint if the permissible stresses in angles & fillet welds are 150 MPa & 108 MPa respectively.

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