



Name :

Roll No. :

Invigilator's Signature :

**CS/B.TECH (CE)/SEM-5/CE-505/2009-10
2009**

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 :

$$10 \times 1 = 10$$

- i) Minimum pitch of rivet, if nominal diameter of rivet (d') in a riveted connection is
- a) $P < 5 d'$ b) $P > 5 d'$
- c) $P \geq 2.5 d'$ d) $P \geq 2.3 d'$.
- ii) The effective throat size of a fillet weld in computing its strength is
- a) 0.707 times the size of weld
- b) function of angle of the hypotenuse
- c) equal the side of fillet
- d) none of these.

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- vii) The distance between centre of two adjacent rivets in a line lying in the direction of stress, shall not exceed in tension member
- a) $12t$ or 200 mm b) $13t$ or 200 mm
- c) $11t$ or 150 mm d) $16t$ or 200 mm.
- viii) Permissible average shear stress in web of plate girder for unstiffened web is
- a) $0.45 f_y$ b) $0.4 f_y$
- c) $0.6 f_y$ d) $0.38 f_y$.
- ix) A pair of tack welded steel channel sections in a tension element, the net area of cross for design criterion is
- a) net area of the web only
- b) net area of the flange only
- c) net area of the web and flange together
- d) web area plus a portion of the area of flanges.
- x) The maximum spacing of the intermediate vertical stiffness of plate girders should be at
- a) $4d$ b) $2.5d$
- c) $1.5d$ d) $0.5d$.

- ## GROUP – B

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

- $1 + 4$



3. a) Define a beam-column member.
b) Describe different modes of failure of riveted joints.

1 + 4

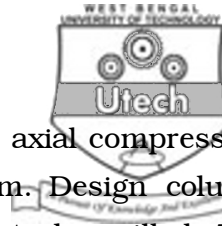
4. Design a fillet welded joint between two plates of size 200×10 mm and 250×10 mm.
5. Calculate the strength of ISA 40×25 , 6-mm thick when used as a tension member with its longer leg connected by (i) 16 mm dia rivets, and (ii) fillet weld.
6. Design welded end connection for a tension member consisting of a channel
MC 300 ($a = 46.3 \text{ cm}^2$, $t_w = 7.8 \text{ mm}$) to develop full strength of the member. The length of the joint is limited to 250 mm.

GROUP – C

(Long Answer Type Questions)

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

7. A gantry girder for an EOT crane is provided with a section consisting of ISMB 500 with a channel section ISLC 300. The channel is connected at the top of the beam with the channel flanges down. Check the suitability of the crane girder section against the permissible bending compressive stress and the permissible bending tensile, if the expected maximum bending moment of the gantry girder is 300 kNm.



8. A column section ISC 200 is to support an axial compression load of 700 kN and 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 and 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 76 N, $F_{bt} = 0.75 F_y$, $V = 0.25$).
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 back side 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 figure 1.

dia

Figure – 1



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

dia

Figure – 2

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