

B.E. Sixth Semester (Civil Engineering) (CGS)
10203 : Structural Design - I : 6 CE 02

P. Pages : 2

Time : Four Hours



AU - 2734

Max. Marks : 80

- Notes :
1. All question carry equal marks.
 2. Answer two question from Section A and two question from Section B.
 3. Due credit will be given to neatness and adequate dimensions.
 4. Assume suitable data wherever necessary.
 5. Illustrate your answer necessary with the help of neat sketches.
 6. Use of Drawing instrument, calculator is permitted.
 7. I.S.I. Hand book for structural Steel section, I.S. Code 800/2007(Revised) I.S. 875 may be consulted.
 8. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) Why serviceability limit state is considered as important as failure limit state? State the various serviceability limit states situated by the code. 13
b) What are the characteristics actions and design actions? 7

OR

2. a) Design a lap joint between the two plates each of width 120mm, if the thickness are 16mm each. The joint has to transfer a factored load of 240kN. The plates are of Fe410 grade. Use M20 bolts of grade 4.6 (bearing type). 10
b) ISA 100×100×8mm angle is to be welded in shop to 12mm thick gusset plate. The angle carries an ultimate pull of 240kN applied along its centroidal axis. Determine the length of side fillet weld required at the heel and toe of the angle. Use 6mm size weld. $f_u = 410 \text{ N/mm}^2$. 10
3. a) Find tension carrying capacity of single angle ISA 100×100×12 connected to gusset plate by means of 20mm dia bolts 5NOS at pitch of 50mm C/C. $f_y = 250 \text{ N/mm}^2$ $f_u = 410 \text{ N/mm}^2$. 10
b) Design double angle section back-to-back on each side of gusset 10mm thick for continuous principal rafter of a truss to carry factored compressive load of 230kN. Centre to centre length of member between centroids of connection is 1.6m, $f_u = 410 \text{ N/mm}^2$. 10

OR

4. An industrial shed of size 10.2m×20m is to be erected in MIDC Amravati. Calculate the panel point loads due to Dead load, live load and wind loads (considering spacing of trusses = 4.0m C/C). Consider area of opening 10% of wall area. 20

SECTION - B

5. Design a built-up column carrying a factored axial load of 2100kN. The effective length of column is 7.5m. Use two I sections. Use steel Fe410 with $f_y = 250 \text{ N/mm}^2$. **20**

OR

6. Design a gusseted base for SC 160 column for: **20**
- i) Axial factored load = 1100kN
 - ii) Concrete grade = M20
 - iii) SBC of soil = 250 kN/m^2
 - iv) Column surface properly finished.
 - v) Use 20mm dia bolts of grade 4.6.
 - vi) Thickness of gusset plate = 16mm.
 - vii) Size of gusset angle $125 \times 75 \times 10 \text{ mm}$
Draw neat sketches showing details.

7. A simply supported beam 7m span carries a uniformly distributed load of 50kN/m (Normal load). The beam is laterally supported. Design the section and show all checks. **20**

OR

8. Design the welded plate girder for an effective span of 22m and carrying a uniformly distributed factored load of 66kN/m. The girder is simply supported at ends. It is fully restrained against lateral buckling throughout the span. Yield stress $f_y = 250 \text{ N/mm}^2$ (Design only the preliminary section). **20**
