BT-4/M-20   **34019**

DESIGN OF STEEL STRUCTURES-I
CE-204-E

Time : Three Hours]   [Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit out of eight questions. All questions carry equal marks.

Unit I

1. (a) Explain the following :   **10**
    (i)   Riveting and Pitch of Rivet
    (ii) Gauge distance and Edge distance
    (iii) Working stress and Factor of safety
    (iv) Types of failure in rivetted joint.

    (b) Two plates 14 mm and 10 mm thick are joined by a double rivetted lap joint. The rivet are 10 mm in diameter and are provided at a pitch of 60 mm. Take permissible stress for rivet in shear and bear are 90 MPa and 270 MPa respectively. The permissible tensile stress in plate is 150 MPa. Determine the strength and efficiency of rivetted joint.   **10**

2. (a) (i) Describe advantages and disadvantages of High strength bolts.

(ii) What are the assumptions made in simple design ? **10**

(b) A tension member consists of two angle sections and carries a load of 200 kN. Design the member when both the angles are connected :

(i) Both sides of gusset plate

(ii) The same side of gusset plate. **10**

Unit II

3. Design a built up column composed of two channel section placed back to back carrying an axial load of 1500 kN, effective length of the column is 7 m. Take $Fy = 250$ N/mm^2. Design single lacing system also. **20**

4. Design a built up battened column to carry an axial load of 2000 kN. The length of the column is 6 m. It is effectively held in position restrained against position rotation at both end. Take $Fy = 250$ N/mm^2. **20**

Unit III

5. A beam, consisting of ISMB 600 @ 122.6 kg/m is simply supported over a span of 6m. Determine the safe load the beam can carry, assuming that the beam is laterally supported. Take $Fy = 250$ N/mm^2 and $E = 2 \times 10^5$ N/mm^2. **20**

6. A hall, measuring 10 m × 25 m from inside is provided with reinforced concrete slab resisting on secondary beams placed at 4m centre to centre. The secondary beams are connected to the web of main beams spaced at 8m centre to centre. Design the main and secondary beams, taking a live load of 2 kN/m². The thickness of the roofing inclusive of the slab is 200 mm. **20**

Unit IV

7. Explain step by step-design procedure of gantry girder. Also discuss the loads acting on gantry girder. **20**

8. (a) Discuss the components of a plate girder. **5**

(b) Design the maximum section of a plate girder for a bridge, for a live load of 50 kN/m and dead load of 30 kN/m. The girder is simply supported over an effective span of 10 m. Take Fy = 250 N/mm² and E = 2×10⁵ N/mm². **15**