

**VI Semester Diploma Examination, March/April-2022**

## **DESIGN OF STEEL AND MASONRY STRUCTURES**

**Time : 3 Hours ]**

**[ Max. Marks : 100**

- Instructions :** (i) Answer any **five** questions from Section – I any **five** questions from Section – II.
- (ii) Use of IS 800 – 2007 and steel table is permitted.
- (iii) Missing data may be assumed suitably.

### **SECTION – I**

1. What are the different types of loads acting on the steel structures ? 5
2. Draw typical sections of structural steel sections. 5
3. What are the advantages of HSFG bolts ? 5
4. Define the efficiency of a joint. How to calculate the efficiency of a joint ? 5
5. Differentiate between laterally restrained and laterally unrestrained beams. 5
6. Define tension member. List types of tension members. 5
7. Define the following : 5
  - (i) Strut
  - (ii) Long column
  - (iii) Slenderness ratio
  - (iv) Radius of gyration
  - (v) Effective length
8. List the various conditions for the stability of dam and explain any one. 5



## SECTION – II

9. Design a lap joint between two plates of size  $60 \times 10$  mm and  $60 \times 8$  mm thick so as to transmit a factored load of 60 kN using single row of M16 bolts grade 4.6 and 410 grade plates. 15
10. A Tie member of a truss consists of an angle section ISA  $65 \times 65 \times 6$  mm of Fe410 grade is welded to an 8 mm gusset plate. Design a weld to transmit a factored load of 150 kN. Welding carried out parallel to load on two edges (Top and bottom of angle section). 15
11. Calculate the load carrying capacity of laterally restrained simply supported beam of section ISMB 500 @ 86.9 kg/m for an effective span of 5 m. 15  
Also check for shear and deflection against load.
12. Design a tension member using unequal single angle section to carry a working load of 100 kN. Use 16 mm diameter bolts. Also check design against yielding, rupture and block shear. 15
13. (a) Design rolled steel column using ISHB section to carry factored load of 1000 kN. Length of a column is 4 m effectively held in position and restrained against rotation both sides. 10  
(b) Determine the design compressive strength of discontinuous compression member of 2ISA  $90 \times 90 \times 10$  mm connected back to back of 12 mm gusset plate. If length of member 3 m. Take design compressive stress value  $120 \text{ N/mm}^2$ . 5
14. (a) Differentiate between Slab base and Gusseted base. 5  
(b) Determine the size and thickness of base plate to carry axial load of 520 kN (working) transferred from column section of ISHB250 @ 536.6 N/m. Use M20 grade concrete for pedestal and grade of steel Fe410. 10
15. A masonry dam 1.2 m wide at top and 3.2 m wide at bottom and 5 m high. It has vertical water face exposed to water. If the water is likely to rise to the top of the dam, calculate the maximum and minimum pressure at the base when the dam is full and when the dam is empty. Take density of masonry =  $22.4 \text{ kN/m}^3$ . Density of water =  $10 \text{ kN/m}^3$ . Draw the stress intensity diagram for both cases. 15

