

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/
COMMERCIAL PRACTICE, NOVEMBER – 2023**

STRUCTURAL DESIGN - I

[Maximum Marks : 100]

[Time : 3 hours]

[Note: Use of IS 456-2000 and SP-16 are permitted]

PART – A

(Maximum Marks : 10)

I. Answer **all** questions in one or two sentences. Each question carries 2 marks.

1. Define workability of concrete.
2. Sketch the stress strain curve for MS bars.
3. Define the term Bond in concrete.
4. How slab is classified into one way slab and two way slab?
5. Define the term slenderness ratio.

(5x2=10)

PART – B

(Maximum Marks : 30)

II. Answer any **five** of the following questions. Each question carries 6 marks.

1. What are the functions of steel reinforcement in R.C.C?
2. Give the steps for design of shear reinforcement.
3. Write notes on:
(i) Development length (ii) Curtailment of bars.
4. What is the function of providing distribution steel in a slab?
5. List the different edge conditions of a two way restrained slab.
6. Describe various steps for design of short axially loaded column.
7. What are footings? How are they classified?

(5x6=30)

PART – C

(Maximum Marks : 60)

(Answer **one full** question from each unit. Each full question carries 15 marks)

UNIT – I

- III.** (a) Differentiate between balanced, under reinforced and over reinforced sections. (6)
- (b) Determine the ultimate moment of resistance of a beam 250mm wide and 500mm deep(effective) reinforced with 4-20mm diameter bars. Use $f_{ck} = 20\text{N/mm}^2$ and $f_y = 415\text{N/mm}^2$. (9)

OR

- IV.** (a) Give steps for determining moment of resistance of a rectangular beam section. (6)
- (b) An RCC beam 230mm x 500mm effective is subjected to a factored moment of 220KNm. Find the reinforcement required. Use M20 grade concrete and Fe 415 grade steel. (9)

UNIT – II

- V.** (a) Sketch the various forms of shear reinforcement. (6)
- (b) Determine the ultimate moment of resistance of a T beam having flange width of 740mm, effective depth of 400mm, web width of 240mm. It is reinforced with 5-20mm diameter mild steel bars. The thickness of slab is 100mm. Use M15 grade concrete and Fe 415 grade steel. (9)

OR

- VI.** (a) Determine the limiting moment of resistance of a reinforced concrete T-beam having flange width of 1600 mm, effective depth of 350 mm and thickness of flange is 100mm. The width of web is 250 mm. Use M20 grade of concrete and Fe 500 steel. (7)
- (b) A reinforced beam of span 5 m is 300 mm wide and 550 mm deep (effective). It has 4 bars of 20mm diameter as tensile reinforcement. The beam carries a load of 28KN/m inclusive of self weight. Design the beam for shear. Use M20 grade concrete and Fe 415 grade steel. (8)

UNIT –III

- VII.** Design a simply supported roof slab for a room 7m x 3m clear in size. The slab is carrying an imposed load of 6 KN/m². Use M20 grade concrete and Fe 415 grade steel. (15)

OR

- VIII.** Design a cantilever slab for an overhang of 1.25m. The imposed on slab consists of 1 KN/m² of live load and weight of finishing is 800N/m². Use M20 concrete and Fe 415 grade steel. (15)

UNIT – IV

- IX.** (a) Write the code provision for selecting the diameter and spacing of laterals and pitch of helical reinforcement in column. (6)
- (b) Design a short RCC square column to carry an axial load of 1400KN. Use M25 grade concrete and Fe 500 grade steel. (9)

OR

- X.** Design a square footing of uniform thickness for an axially loaded column of 500mm x 500mm size. The safe bearing capacity of soil is 210KN/mm². Load on column is 900KN. Use M20 concrete and Fe 415 steel. (15)
