

TED (10)–4005

(REVISION—2010)

Reg. No.

Signature

FIFTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/
TECHNOLOGY—OCTOBER, 2012

STRUCTURAL DESIGN
(Common to AR, CE, EN, QS and WR)

[Time : 3 hours

(Maximum marks : 100)

[Note : Use of IS 456-2000, IS 800-2007, SP-16 and steel tables are permitted.]

PART—A

(Maximum marks : 10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. What is the average permissible stress of M_{20} and Fe 415 grade concrete and steel ?
2. Which are the different types of shear reinforcements ?
3. Distinguish between short and long column.
4. What is the effective length of a prismatic compression member with one end restrained against translation and rotation and the other end is free for rotation but restrained against translation ?
5. Which are the structural steel sections used as purlins ? (5×2=10)

PART—B

(Maximum marks : 30)

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

1. What is limit state ? What are the various limit states for which a section is designed ?
2. Calculate the development length required for the tensile steel (Fe 415) of 12mm dia. for a beam simply supported on a 250 mm thick wall with a bending moment of 38 kNm and shear force of 48kN and M25 grade concrete.
3. How is the effective span of stairs determined under different conditions ?
4. What are the different types of lateral reinforcements ? What are the code recommendations for spacing, diameter and pitch ?
5. What are the advantages and disadvantages of steel structures over RCC structures ?
6. Explain different types of welded connections with sketches.
7. State the functions of the following in a plate girder :
(i) Flange (ii) Web (iii) Stiffener (iv) Splicing (5×6=30)

PART—C

(Maximum marks : 60)

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

UNIT—I

- III (a) What is bond strength and how can it be increased? 6
- (b) Find the ultimate moment of resistance of a doubly reinforced beam for the following details : Breadth-300 mm, Eff. Depth-550mm, compression steel-3 nos.-16 mm dia. Tensile steel 6 nos.-20 mm dia. eff. cover-50 mm, Concrete-M20 Steel-Fe415. 9

OR

- IV (a) Distinguish between X_u and $X_{u, \text{limit}}$. Explain the different types of sections based on the relation between X_u and $X_{u, \text{limit}}$. 6
- (b) A doubly reinforced beam of size 250×465 with an effective span of 7.2 m carries a total load of 24 kN/m. Design the tension and compression steel using M25 concrete and Fe 415 steel. 9

UNIT—II

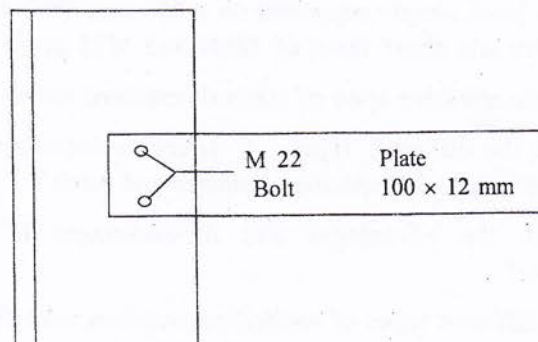
- V (a) Which are the critical positions for the determination bending moment in a continuous slab? 3
- (b) A one way slab of 3.3 m eff. span supports a total factored load of 10 kN/m^2 . Using M20 grade concrete and Fe 415 steel, design the slab. Check only for deflection. 12

OR

- VI (a) Sketch a T beam and mark all the parts and dimensional notations. 6
- (b) Find the ultimate load that can be carried by a square column of 400 mm with 8 nos. of 16 mm dia. longitudinal steel having an eff. length of 4 m using M20 and Fe 415 steel. 9

UNIT—III

- VII (a) What are the physical and mechanical properties of structural steel? 6
- (b) Determine the net area A_n for the tension member shown in figure when :
 (i) holes are drilled (ii) holes are punched



OR

- VIII (a) Explain the different modes of failure of tension members. 6
- (b) Design a double angle discontinuous strut to carry a factored load of 160 kN. The length of the strut is 3 m between the intersections. The 2 angles are placed back to back and tack bolted. Consider the angles are placed on opposite sides of the gusset plate. 9

UNIT—IV

- IX (a) Write the design steps of a laterally supported beam. 7
- (b) Calculate the basic wind pressure for a shed of $40 \times 20 \times 12$ size if basic wind speed is 47m/sec, $K_1 = 1.0$, $K_2 = 0.904$, $K_3 = 1.0$. 8

OR

- X (a) Write short notes on :
- (i) Pitch of trusses
 - (ii) Spacing of trusses
 - (iii) Purlins. 6
- (b) Design a simply supported beam of eff. span 4.5 m carrying a factored point load of 280 kN at mid span. 9

MADIN Polytechnic College