

TED (10)–4005

Reg. No. ....

(REVISION—2010)

Signature .....

FIFTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/  
TECHNOLOGY—OCTOBER, 2013

**STRUCTURAL DESIGN**

(Common to CE, EV, WR, QS and AR)

[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 all questions in one or two sentences. Each question carries 2 marks.
1. Define neutral axis.
  2. What is Lap length ?
  3. What is meant by two way shear in a column footing ?
  4. What are the various grades of structural steels used ?
  5. What are the two types of members in a truss based on stress ? (5×2=10)

**PART—B**

(Maximum marks : 30)

- II Answer *any five* of the following questions. Each question carries 6 marks.
1. What are the various methods of proportioning of concrete mixes ?
  2. Which are the various deflection checks recommended by IS 456-2000 ?
  3. One way slab having an effective span of 2.6 m is made M20 and Fe415 steel and carries a total factored load of 7.5kN/m<sup>2</sup>. Determine the diameter and spacing of main and distribution steel.
  4. Explain the following in the design of a column footing :
    - (i) Design for bending moment
    - (ii) One way shear
    - (iii) Two way shear.
  5. What are the physical and mechanical properties of structural steel ?
  6. Which are the different forms of beam cross sections used as flexural members ?
  7. What are the different types of loads acting on a roof truss ? (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 the concept of doubly reinforced beam and what is the need of it? 6
- (b) A cantilever beam has a projection of 2.1 m and cross section of  $230 \times 300$  mm. The beam carries a UDL of 10kN/m excluding the self weight and a concentrated load of 3kN at the free end. Using M20 grade of concrete, Fe415 grade steel and 3 nos. of 20 mm dia. tensile steel, check the beam for deflection and find the development length required. 9

OR

- IV (a) How is the effective flange width of a beam calculated and what is the code recommendation? 7
- (b) Design a lintel over an opening of 1.5 m using M20 grade concrete, Fe415 grade steel. The masonry wall has a thickness of 220 mm and height of 1.4 m above the lintel with a unit weight of  $19 \text{ kN/m}^3$ . 8

## UNIT—II

- V (a) What is the IS recommended live load on the following :  
 (i) Residential floors (iv) Institutional floors  
 (ii) Roof slab access provided (v) Roof slab without access.  
 (iii) Over crowded landing 5
- (b) Determine the positive and negative reinforcement at critical positions for the continuous slab detailed below : Number of spans – 4 nos. Eff. span – 4m. Dead load –  $3 \text{ kN/m}^2$ . Live load –  $2 \text{ kN/m}^2$ . Concrete – M20 Steel Fe 415. 10

OR

- VI (a) How is the effective span of stairs found under different end conditions as per code? 3
- (b) Design a square footing for a square column 220 mm to carry an axial load of 400 kN. S B C of soil is  $100 \text{ kN/m}^2$ . Use M30 and Fe415 steel. 12

## UNIT—III

- VII (a) Which are the various methods of structural analysis of steel structures? 3
- (b) Design a column to support an axial load of 1100 kN. The column has an effective length of 6 m with respect to Z axis and 4m with respect to Y axis. Use Fe410 grade steel. 12

OR

- VIII (a) What are the advantages and disadvantages of bolted connections? 6
- (b) A single unequal angle ISA  $90 \times 60 \times 6$  mm is connected to a 10 mm gusset plate at the ends with 5 nos. of 16 mm bolts. If the gusset is connected to 90 mm leg, determine the design tensile strength of the angle. 9

## UNIT—IV

- IX (a) Sketch the line diagram of a French truss and mark the members. 6  
(b) Design a single angle strut connected to the gusset plate to carry 65 kN factored load. The length of the strut between centre to centre of intersection is 2.5 m. 9

OR

- X (a) Sketch the cross section of a plate girder and mark the components. 6  
(b) Design a simply supported beam of effective span 1.5 m carrying a factored point load of 380 kN at mid span. 9
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