

TED (10)–4005

Reg. No.

(REVISION—2010)

Signature

FIFTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/
TECHNOLOGY—MARCH, 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 the following questions in one or two sentences. Each question carries 2 marks.

1. Which are the Partial safety factors used in Limit state method ?
2. Explain Bond strength.
3. What is the slenderness limit for RCC columns as per IS Code ?
4. Which are the different types of connections used in steel members ?
5. What is the function of a stiffener in a plate girder ?

(5×2=10)

PART—B

(Maximum marks : 30)

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

1. Distinguish between X_u and $X_{u \text{ limit}}$. Explain the different types of sections based on the relation between X_u and $X_{u \text{ limit}}$.
2. Sketch and mark the parts of a flanged beam. Enumerate advantages of flanged beams.
3. What is a continuous slab ? What are the precautions to be taken while designing and constructing a continuous slab ?
4. 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 effective length of 4 m using M 25 and Fe 415 steel.
5. Which are the various methods of structural analysis of steel structures ? Explain.
6. Sketch the cross section of a plate girder and mark the components.
7. List the various roof covering materials.

(5×6=30)

PART—C

(Maximum marks : 60)

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

UNIT—I

- III (a) Explain :
- (i) Limit state of collapse (ii) Limit state of serviceability 6
- (b) A simply supported beam of effective span 4.8 m is carrying a UDL of 22kN/m including the self weight. Taking size of beam as 250 × 350 mm effective depth and 3 numbers of 16 mm dia. tension steel of which one is bend up at 1/7 of effective span from support. Check for shear and design for shear with 2 legged vertical stirrups of 6 mm dia. using M 20 and Fe 415 steel. 9

OR

- IV (a) A singly reinforced cantilever beam of effective span 1.5 m and carry a UDL of 12kN/m excluding the self weight. Design for flexure with M 20 and Fe 415 steel. 9
- (b) Check for the shear and deflection of the beam in question IV (a). 6

UNIT—II

- V (a) Under which circumstances torsion reinforcements are provided in a slab. What is the code recommendation ? 7
- (b) Design the transverse reinforcement for an RCC column of size 250 × 600 mm with 8 numbers of 20 mm dia. longitudinal rods. 8

OR

- VI (a) Sketch and mark all the structural elements of an isolated column. 6
- (b) Determine the positive and negative reinforcement at critical positions for the continuous slab detailed below : Number of spans—5 nos. Eff. span—3.6 m, Dead load —3.5 kN/m², Live load —2kN/m², Concrete—M20 Steel Fe 415. 9

UNIT—III

- VII (a) Sketch the figures of the following built up columns :
- (i) Battened column (iii) Laced and battened column 6
- (ii) Single laced column
- (b) In a compression strut 3 m long consist of 2 angles 100 × 100 × 6 mm. Find the factored strength of the member if the angles are connected on both sides of 12 mm gusset by (1) 2 bolts and (2) welding. 9

OR

- VIII (a) What are the advantages and disadvantages of welded connections ? 6
- (b) A single unequal angle ISA 90 × 60 × 6 mm is connected to a 10 mm gusset plate at the ends with 4 nos. of 18 mm bolts. If the gusset is connected to 60 mm leg, determine the design tensile strength of the angle. 9

UNIT—IV

- IX (a) State the functions of the following in a plate girder :
- | | | |
|------------|-----------------|---|
| (i) Flange | (iii) Stiffener | |
| (ii) Web | (iv) Splicing. | 6 |
- (b) I beams provided in a hall has an effective span of 6.3 m and spacing of 3 m. The beam has an RCC slab of 100 mm thickness, finishing load of 0.75 kN/m^2 , live load of 2.5 kN/m^2 and self weight of beam as 0.8 kN/m . Design a suitable section and check for shear. 9

OR

- X (a) Explain the functions with sketches of any four of the following parts of a truss :
- | | | |
|-------------------|--------------|---|
| (i) top chord | (iv) strut | |
| (ii) bottom chord | (v) sag tie. | |
| (iii) sling | | 8 |
- (b) Calculate the basic wind pressure for a shed of $45 \times 20 \times 14 \text{ m}$ size if basic wind speed is 45 m/sec , $K_1 = 1.0$, $K_2 = 0.934$, $K_3 = 1.06$. 7