

TED (10)-4005

Reg. No.

(REVISION--2010)

Signature

FIFTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/
TECHNOLOGY—OCTOBER, 2014

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.]

Marks

PART—A

(Maximum marks : 10)

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

1. How design strength of a material is obtained ?
2. State the purpose of cement and water paste in concrete.
3. What is the purpose of providing distribution steel in one way slab ?
4. What is erection load ?
5. What is meant by web crippling ?

(5×2=10)

PART—B

(Maximum marks : 30)

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

1. Explain the various design methods of RCC members.
2. Calculate the development length required for the tensile steel (FE 415) of 16mm dia for a beam simply supported on a 220 mm thick wall with a bending moment of 42KN and shear force of 52KN and M 25 grade concrete.
3. How is the effective span of stairs determined under different conditions ?
4. Design and sketch the main and distribution steel of a cantilever slab with an overhang of 1.0m from a wall of 300mm thick. The live load on the slab is 2.5KN/m².
5. Write down the advantages and disadvantages of high strength friction grip (HSFG) bolts.
6. Design the welded connection to connect two plates of width 250mm and thickness 12mm for 100 percent efficiency.
7. Write down the elements of a plate girder and what is the purpose of each element ?

(5×6=30)

PART—C

(Maximum marks : 60)

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

UNIT—I

- III (a) A hall of $7\text{m} \times 28\text{m}$ is covered by RCC slab 130mm thick supported on beams spaced at 3.5m intervals. The width of rib is 300mm. Find the effective width of flange of T-beams. 6
- (b) A simply supported rectangular beam $300\text{mm} \times 420\text{mm}$ overall depth is provided with 4 bars of 16mm dia as tension steel and 3 bars of 16mm dia as compression reinforcement. The span of the beam is 5m and Fe 415 grade steel is used. Assuming effective cover to reinforcement is 40mm, check the beam for stiffness. 9

OR

- IV (a) How is the area of reinforcement in compression face (A_{sc}) is calculated in case of doubly reinforced beams ? 6
- (b) A hall of $6\text{m} \times 17.5\text{m}$ is covered with a RCC slab 100mm thick supported on beams spaced at 3.5m/c. The superimposed load on the slab is 3KN/m^2 . If the beams are cast monolithically with the slab, design an intermediate beam. Use M20 concrete and Fe 415 grade steel. Use appropriate Partial safety factor. 9

UNIT—II

- V (a) Design a short RCC column to carry an axial load of 900KN. Use M20 concrete and Fe415 steel. 6
- (b) A doubly reinforced rectangular beam of size $250 \times 450\text{mm}$ effective depths is provided with 4 bars of 16mm dia in tension zone and 3 bars of 16mm dia in compression zone. If the beam supports a factored shear force of 100KN, design the shear reinforcement use M20 concrete and Fe 250 grade steel. 9

OR

- VI (a) Under what circumstances, torsion reinforcements are provided in a slab. What is the code provisions ? 6
- (b) Determine the positive and negative reinforcement at critical position for the continuous slab detailed below :
- Number of spans — 4 Nos.
 Effective spans — 3.8 m.
 Dead load : 3KN/m^2 , Live load : 2.5KN/m^2
 M20 grade concrete and Fe 415 steel 9

UNIT—III

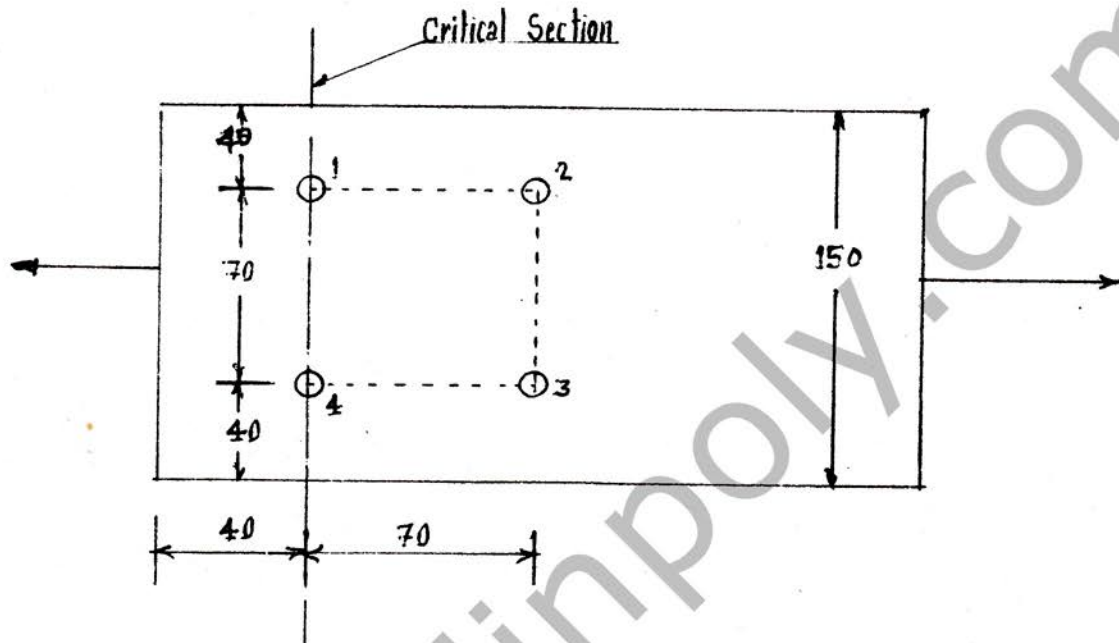
- VII (a) What are the advantages and disadvantages of welded connection ? 6
- (b) A column 3.8m long has to support a factored load of 5000KN. The column is effectively held at both ends and restrained in direction at one of the ends. Design the column using beam section and plates. 9

OR

VIII (a) Sketch a column with :

(i) Single laced system (ii) Double laced system. (iii) Battered system. 6

(b) Determine the design tensile strength of the plate $150\text{mm} \times 12\text{mm}$ with the holes for 16mm dia bolts as shown in figure. Steel used is of Fe 415 grade quality. 9



UNIT—IV

IX (a) With the aid of sketch, distinguish between laterally restrained and unrestrained beams. 6

(b) A roof of a hall measuring $8\text{m} \times 12\text{m}$ consist of 100mm thick RCC slab supported on steel I-beams spaced 3m apart. Wall thickness is 30cm. The finishing load may be taken as 1.5KN/m^2 . Design the steel beam. 9

OR

X (a) Write short notes on :

(i) Pitch of truss (ii) Purlin (iii) Sag tie. 6

(b) Design a simply supported steel beam of effective span 2m carrying a factored concentrated load of 360KN at midspan. 9