TED (10) – 4005

(REVISION — 2010)

Reg. No. .....

Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

STRUCTURAL DESIGN

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. Define characteristics strength of concrete.
2. Which are the different types of shear reinforcement ?
3. Define modular ratio.
4. What is meant by web crippling ?
5. What do you mean by slenderness ratio ? (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. State the assumption made in the limit state method.
2. Calculate the development length required for the tensile steel (Fe 415) of 20 m diameter for a beam simply supported on a 230mm thick wall with a bending moment of 50kN and shear force of 65kN and M20 grade concrete.
3. What are the different types of lateral reinforcements ? What are the code recommendation for spacing, diameter and pitch ?
4. Write the step for design of short axially loaded RCC column.
5. Design the welded connection to connect two plates of width 300mm and thickness 10mm for 80 percent efficiency.
6. What are the advantages and disadvantages of steel structures over RCC structure ?
7. What is plate girder ? Sketch a typical plate girder where it is used. (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 beam of rectangular section is 250mm wide and 500mm effective depth and is provided with 4 bars 16mm diameter as tensile steel. Find the ultimate moment of resistance. Use M20 concrete and Fe 415 steel. 6

(b) A concrete beam has 350mm breadth and 700mm effective depth. Design the beam if it is subjected to a superimposed bending moment of 400kNm. Use HYSD bars of grade Fe 415 and concrete of grade M20. 9

OR

Marks

IV (a) A hall of 8m × 24m is covered by RCC slab 130mm thick simply supported beams spaced at 3m intervals. The width of ribs is 300mm. Find the effective width of flange of T- beam. Take effective depth as 400mm. 5

(b) Design shear reinforcement for a simply supported beam 250mm wide, 500mm effective depth and effective span of 5m carries a superimposed load of 7 kN/m. Assume percentage steel provided as 1%. Use M20 concrete and Fe 415 steel. 10

UNIT — II

V (a) Under what circumstances torsion reinforcements are provided in a slab ? What is the code provision ? 5

(b) Design a simply supported slab of effective span 3.75m for a live load of 2500N/mm^2. Take fck = 20N/mm^2, Fe 415 steel. 10

OR

VI (a) Design an axially loaded short column subjected to a factored load of 1900kN. The reinforcement is provided on four sides. Use M20 concrete and Fe 250 steel. 6

(b) A square column 500mm × 500mm carries an axial load of 1500kN. Design the square footing for the column. The safe bearing capacity of soil is 225kN/m^2. Use M20 concrete and Fe 415 steel. 9

UNIT — III

VII (a) What are the advantages of welded connection ? 6

(b) Design a single angle section for a tension member of a roof truss to carry a factored tensile force of 225kN. The member is subjected to the possible reversal of stress due to the action of wind. The effective length of the member is 3m. Use 20mm shop bolt of grade 4.6 for the connection. 9

OR

VIII (a) What are the advantages of bolted joints ? 6

(b) Design a single angle strut connected to the gusset plate to carry 180kN factored load. The length of the strut between center to center connection is 3m. 9

UNIT — IV

IX (a) State the function of the following in a plate girder.

(i) Flange (ii) Stiffener
(iii) Web (iv) Splices 8

(b) Design angle purlin for the following data by simplified method.
Spacing of trusses = 3.5m
Spacing of purlins = 1.6m
Weight of AC sheets including laps and fixtures = 0.205 kN/m^2
Inclination of main rafter of truss = 21
Live load = 0.6kN/m^2
Wind load = 1 kN/m^2 7

OR

X (a) What are the loads acting on the roof truss ? 8

(b) Calculate the basic wind pressure for a shed of 50 × 25 × 14m size, if basic wind speed is 50m/sec. $K_1 = 1$, $K_2 = 0.94$, $K_3 = 1$. 7