PVP 19

Code:19CE3503

III B.Tech - I Semester – Regular Examinations – JANUARY 2022

DESIGN OF REINFORCED CONCRETE STRUCTURES
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) Define characteristic compressive strength of concrete.
   b) How do you calculate the effective flange width of a T beam?
   c) List out types of shear failures.
   d) How do you classify one-way and two-way slabs?
   e) What is the minimum eccentricity to be provided according to IS 456:2000?

PART – B

UNIT – I

2. a) Write a short note on i) working stress method, ii) ultimate stress method, and iii) limit state method. 6 M
   b) Explain the stress block parameters with neat diagram. 6 M

OR

3. a) Explain the terms i) under-reinforced section, ii) balanced section, and iii) over-reinforced section. 6 M
   b) List out various IS codes used in the design of RC structural members. Write a short note on grade of concrete and grade of steel. 6 M

UNIT – II

4. a) Design a singly reinforced concrete beam of width 250 mm, subjected to an ultimate moment of 130 kNm. Assume f_{ck} = 20 MPa and f_y = 415 MPa. 6 M

   b) Design a simply supported rectangular RC beam, having a span of 5.5 m, subjected to a uniformly distributed load of 33.8 kN/m. Compute the required reinforcement, assuming the breadth of beam as 230 mm and the effective cover for compression and tension reinforcement as 50 mm. Assume that the beam is supported by load-bearing masonry of thickness 230 mm. Use M20 concrete and Fe 415 grade steel. 6 M

OR

5. a) An RC beam has a width of 200 mm and an effective depth of 450 mm. The effective covers for tension and compression reinforcement are 50 mm and 30 mm, respectively. The beam is reinforced with three bars of 20 mm diameter in tension and three bars of 16 mm diameter of Fe 415 grade in compression. Assuming M20 concrete, calculate the ultimate moment carrying capacity of the beam. 6 M

   b) Design a T-beam to span 8 m supporting a one-way slab of thickness 150 mm and subjected to a live load of 4 kN/m^2 and a dead load (due to floor finish, partition, etc.) of 1.5 kN/m^2, in addition to its self-weight. Assume Fe 415 steel and M20 concrete and the c/c of beams as 4 m 6 M

UNIT-III

6. a) A rectangular beam of size 230 mm width and 450 mm effective depth is reinforced with four bars of 20 mm diameter. Determine the required vertical shear reinforcement to resist the factored shear force of (a) 70 kN, (b) 250 kN, and (c) 400 kN. Consider concrete of grade M25 and steel of grade Fe 415. 6 M

b) Design the torsional reinforcement in a rectangular beam section, 350 mm wide and 750 mm deep, subjected to an ultimate twisting moment of 140 kNm, combined with an ultimate (hogging) bending moment of 200 kNm and an ultimate shear force of 110kN. Assume M 25 concrete, Fe 415 steel and mild exposure conditions. 6 M

OR

7. a) Calculate the shear resistance of a beam of width 300 mm and effective depth 500 mm reinforced with five 20 mm bars at the mid-span of which two bars are bent at the ends at 45°. The beam is provided with shear reinforcement of 8 mm diameter two-legged vertical stirrups throughout the beam at a spacing of 160 mm. M20 concrete and Fe 415 steel have been adopted. 6 M

b) Design a rectangular beam section, 300 mm wide and 550 mm deep (overall), subjected to an ultimate twisting moment of 25 kNm, combined with an ultimate bending moment of 60 kNm and an ultimate shear force of 50 kN. Assume M 20 concrete, moderate exposure conditions and Fe 415 steel. 6 M

UNIT – IV

8. a) A hall in a building has a floor consisting of slab cast monolithically with simply supported 230 mm wide beams spaced at 3.5 m c/c. The clear spans of the beam is 6 m. Assuming the live load on slab as 3.0 kN/m^2 and partition plus load due to finishes as 1.5 kN/m^2, design the slab with M25 grade concrete and Fe 415 steel. 6 M

b) Design a floor slab for an interior room, with clear dimensions of 3.5 m × 9 m, for a building located in Chennai. The slab is resting on 230 mm thick masonry walls. Assume live load as 4.0 kN/m^2 and dead load due to finish, partition, etc., as 1.5 kN/m^2. Use M25 concrete and Fe 415 steel. 6 M

OR

9. a) Design a floor slab for an interior room, with clear dimensions of 3.0 m × 8 m, for a building located in Mumbai. The slab is resting on 230 mm thick masonry walls. Assume live load as 3.0 kN/m^2 and dead load due to finish, partition, as 1.2 kN/m^2. Use M20 concrete and Fe 415 steel. 6 M

   b) Design a cantilevered portico slab of 5 m width and 2 m clear span. Assume moderate environment, with M25 concrete and Fe 415 grade steel. 6 M

UNIT – V

10. a) Design a column of height 3 m, which is effectively held in position and restrained against rotation at bottom and at top. It is subjected to an axial load of 1650 kN under dead and live load condition. Use M25 concrete, Fe 415 steel, and assume moderate environment. 6 M

    b) A column of height 1.5 m is pinned at the bottom and effectively restrained against rotation but not held in position at the top. It is subjected to a factored axial load of 2500 kN under the combination of dead load and live load. Design the column, using M30 concrete and Fe 415 steel. 6 M

OR

11. a) Design a spiral column subjected to an unfactored load of 1600 kN. Effective length of column is 3.5 m. Use M25 concrete, Fe 415 steel, and assume moderate environment. 6 M

    b) Design a short rectangular column subjected to a factored load of 1400 kN and a factored moment of 90 kNm. Adopt M25 concrete and Fe 415 grade steel and assume mild environment. 6 M