Hall Ticket No | | | | | | | | | | | Question Paper Code: ACE009

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations (Supplementary) - January, 2019

Regulation: IARE – R16

REINFORCED CONCRETE STRUCTURES DESIGN AND DRAWING

Time: 3 Hours **(CE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only
IS 456:2000 is permitted

UNIT – I

1. (a) Enumerate the limit states commonly used in limit state design and state briefly how they are provided in the design **[7M]**

   (b) A doubly reinforced R/C beam 300x600mm (effective depth) carry factored moment 450kN-m. Find the area of steel (compressive and tensile steel). Assume cantilever beam with moderate exposure condition Use M20 concrete Fe500 HYSD steel **[7M]**

2. (a) Draw the stress block parameters of rectangular R/C beam in limit state method . Also define the terms Limit state collapse and Limit state serviceability conditions. **[7M]**

   (b) A doubly reinforced R/C beam 300x400mm (effective depth) carry factored moment 400kN-m. Find the area of steel (compressive and tensile steel). Assume simply supported beam at severe exposure condition Use M20 concrete Fe415 HYSD steel **[7M]**

UNIT – II

3. (a) Under what situations do the following modes of cracking occur in reinforced concrete beams:
   i.Flexural cracks, **[7M]**
   ii. Diagonal tension cracks,
   iii. Flexuralshear cracks
   iv. Splitting cracks

   (b) Determine the ultimate moment of resistance of the following T beam; b_f = 450 mm, D_f = 150 mm, b_w = 300 mm, d = 400 mm, A_{st} = 2100 mm^2. Assume f_y = 415 N/mm^2 and f_{ck} = 25 N/mm^2. **[7M]**

4. (a) Explain the approaches for control of deflection in bending members as per IS 456. What are the measures for reducing deflection? **[7M]**

   (b) Detail the reinforcement for the following beam, to confirm to the empirical rules in IS 456:2000 for crack control in beams. b = 450 mm, Ast = 6 Nos. of 25 mm Fe 415 [2950 mm^2], total depth of beam = 950 mm. **[7M]**

UNIT – III

5. (a) Discuss the Design procedure for two way slab. Explain IS: 456 code method for design of slab. **[7M]**

   (b) Design a R/C slab of 3x8 m supported on beams 200x450mm at two sides. Assume imposed load 3kN/m^2 and use M20, Fe415 HYSD steel and corners prevented from uplift. Detail the reinforcement (Use limit state method) **[7M]**

6. (a) What type of slabs is usually used in practice, underreinforced or over-reinforced? Explain the need for corner reinforcement in two way rectangular slabs whose corners are prevented from lifting up. **[7M]**

   (b) Design a reinforced concrete slab 6.3 x 4.5 m simply supported on all the four sides. It has to carry a characteristic live load of 10 kN/m^2, in addition to its dead weight. Assume M25 concrete and Fe 415 steel. (The exposure condition to environment can be classified as mild). **[7M]**

UNIT – IV

7. (a) Explain the step by step procedure for design of centrally loaded short column. **[7M]**

   (b) Design a circular pin-ended column 400 mm dia and helically reinforced, with an unsupported length of 4.5 m to carry a factored load of 900 kN. Assume M30 grade concrete and Fe 415 steel. **[7M]**

8. (a) What are the factors that affect the behaviour of slender columns? Write the design procedure for slender columns for both braced and unbraced column. **[7M]**

   (b) A column 300 mm x 400 mm has an unsupported length of 3 m and effective length of 3.6 m. It is subjected to Pu = 1100 kN and Mu 230 kNm about the major axis. Determine the longitudinal steel using fck = 25 N/mm^2 and fy = 415 N/mm^2. Assume d' = 60 mm. **[7M]**

UNIT – V

9. (a) Explain with a neat sketch different types of foundations. What are the Indian standard code recommendations for design of footings as per IS: 456-2000? **[7M]**

   (b) Design doglegged stair case of head room 3mx5m for floor height 3.2m. Assume tread 250mm and riser 150mm and live load 3kN/ m^2. Use M20 concrete and Fe415steel. Detail the reinforcement of stair slab. Use limit state design (steps are RCC). **[7M]**

10. (a) Discuss the step by step design procedure for as sloped footing. **[7M]**

    (b) A solid footing has to transfer a dead load of 1000 kN and an imposed load of 400 kN from a square column 400 mm x 400 mm (with 16 mm bars). Design the footing, assuming f_y = 415 and f_{ck} = 20 N/mm^2, and safe bearing capacity to be 200 kN/m^2. **[7M]**