Faculty of Engineering & Technology

Fifth Semester B.E. [Civil Engg.] (C.B.S.)
Examination

REINFORCED CEMENT CONCRETE STRUCTURES

Time : Four Hours]   [Maximum Marks : 80

INSTRUCTIONS TO CANDIDATES

(1) All questions are compulsory and carry marks as indicated.

(2) Due credit will be given to neatness and adequate dimensions.

(3) Assume suitable data wherever necessary.

(4) Illustrate your answers wherever necessary with the help of neat sketches.

(5) IS 456 : 2000, IS 875, IS 1343, IS 3370 may be consulted.

1. (a) What are the assumptions made in elastic theory of RCC design ?   4

   (b) A RCC beam is having an effective span of 4 m and is loaded with an udl on its entire span. It has width of 250 mm and effective depth of 500 mm and is reinforced with 4 numbers of 16 mm dia. bars Use M20 grade concrete and Fe 415 steel. Find its moment of resistance and safe working load. (Use WSM).   10

OR

2. (a) From fundamentals, derive the expressions for neutral axis depth factor (n), lever arm coefficient (j) and moment of resistance (Q) factor for a balanced rectangular singly reinforced RCC beam in Working Stress method. 7

(b) A reinforced concrete beam of rectangular section 300 mm × 650 mm is reinforced with 4 bars of 32 mm dia. bars. Compute moment of resistance of the beam. Use M 20 grade concrete and Fe 415 HYSD bars. Take effective cover of 50 mm. 7

3. (a) What are the advantages of prestressed concrete over RCC ? 4

(b) A post-tensioned cable of a beam 10 m long is initially tensioned to a stress of 1000 N/mm² at one end. If the tendons are curved so that the slope is 1 in 24 at each end with an area of 600 mm², calculate the loss of prestress due to friction for the following data :

Coefficient of friction between duct and cable = 0.55, friction coefficient for wave effect = 0.0015 per m.

During anchoring, if there is a slip of 3 mm at the jacking end, calculate the final force in the cable and the percentage loss of prestress due to friction and slip. 9

OR

4. (a) Write a short note on any one of the prestressing systems. 4

(b) The prestressed concrete beam of rectangular section 300 mm wide and 600 mm deep has a span of 10 m. The effective prestressing force is 980 kN at an eccentricity of 120 mm. The dead load of the beam is 4.5 kN/m and the beam has to carry a live load of 7.5 kN/m. Determine the extreme stresses :

(i) at the mid section without the action of live load and

(ii) at the mid section with the action of live load. Draw the stress diagrams. 9

5. (a) What is the limit state of serviceability ? Explain its importance. 3

(b) The rectangular RCC beam has a width of 200 mm and an effective depth of 400 mm. If it is reinforced with 2 bars of 20 mm dia, find its moment of resistance. Use M 20 grade concrete and Fe 415 HYSD steel. (Use LSM). 10

OR

6. (a) Explain the following :

(i) Balanced Section

(ii) Underreinforced section and

(iii) Overreinforced section. 3

(b) A RCC beam is simply supported over the supports having width of 300 mm and is having clear span of 4 m. Take imposed load of 5 kN/m, at service. Design a singly reinforced beam using M 20 grade concrete and Fe 415 HYSD steel. (Use LSM).

10

7. (a) What is a flanged beam ?

2

(b) Calculate the moment carrying capacity of a T.beam having the following design data :

(i) Width of flange = 1500 mm

(ii) Depth of flange = 110 mm

(iii) Overall depth = 550 mm

(iv) Width of web = 300 mm

(v) Reinforcement of 5 numbers of 25 mm dia bars at tension side.

(vi) Effective cover = 50 mm.

Use M 20 grade concrete and Fe 415 steel. (Use LSM).

11

OR

8. (a) What are the design checks for single (one way) shear and double (two way) shear in footings ?

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(b) Design a rectangular RCC column of size 450 mm × 600 mm is subjected to an axial load of 2000 kN under service load including live loads. The column has an effective length of 3 m. Use M20 and Fe 415. (Use LSM)

9

9. (a) Write a brief note on causes of cracking in RCC and their control.

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(b) A rectangular RCC beam having width 230 mm and effective depth 450 mm is subjected to a factored shear force of 150 kN. Design the shear reinforcement if it is reinforced with 6 bars of 12 mm diameter as main reinforcement. Use M20 concrete and Fe 415 steel. (Use LSM).

9

OR

10. (a) Explain moment-curvature relationship of a RCC beam.

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(b) A rectangular RCC beam of overall dimension 300 mm × 550 mm is subjected to a bending moment of 130 kNm, shear force of 55 kN and a torsional moment of 40 kNm at service conditions. Design the beam using M20 concrete and Fe 415 steel. (Use LSM).

10

11. Design a one way reinforced concrete slab supported at the edges for a public building with a clear span of 4 m supported over 200 mm solid concrete masonry walls. Use M 20 and Fe 415. Sketch the reinforcement details. Live load on slab is 3.5 kN/m². (Use LSM). 14

OR

12. A two way RCC slab is to be provided for a room of size 4 m × 6 m (effective) with continuous edges all round at supports. Take LL = 4 kN/m² and Floor finish = 1 kN/m². Use M 20 and Fe 415.

    (i) Calculate B.M. along both X and Y directions.

    (ii) Calculate reinforcement along X direction.

    (iii) Provide check for shear stress.

    (iv) Taking steel in Y-direction, same as in X direction, sketch the reinforcement details. 14