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21CV53

## Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025 Design of RC Structural Elements

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS456/2000 and SP 16 is permitted.  
3. Assume any missing data.*

### Module-1

- 1 a. Explain working Stress Method and also differentiate between working Stress Method and Limit State method. (10 Marks)
- b. Explain the stress block parameters with a neat sketches for a rectangular RC section. (10 Marks)

OR

- 2 a. Briefly explain the step by step procedure for short term deflection and long term deflection. (10 Marks)
- b. Explain the term balanced, under reinforced and over – reinforced section with neat sketch. (10 Marks)

### Module-2

- 3 a. List the situations which require the adoption of doubly reinforced beam. (06 Marks)
- b. A RCC beam of section 300 mm × 500 mm is reinforced with 4 bars of 16 mm diameter with an effective cover of 50 mm. The beam is simply supported over a span of 5 m. Find the maximum permissible UDL( including self weight) on the beam. Use M20 grade concrete and Fe500 grade steel. (14 Marks)

OR

- 4 a. A rectangular beam 230 mm wide and 535 mm effective depth is subjected to a bending moment of 88.5 KN-m at working loads. Find the steel arc required. Use M 15 grade concrete and Fe415 grade steel. (10 Marks)
- b. A Tee – beam of effective flange width 1500 mm thickness of slab 100 mm, width of rib 300 mm and effective depth 560 mm is reinforced with 4 No's of 25 mm diameter bars. Calculate the factored moment of resistance. Use M 20 grade concrete and Fe415 grade steel. (10 Marks)

### Module-3

- 5 A rectangular beam is simply supported on 230 mm thick wall with a clear span of 6 m. The beam is to have width 300 mm. The super imposed load is 12 KN/m. Design beam for flexure and shear. Check for deflection and sketch the details of reinforcement. Use M20 grade concrete and Fe415 grade steel. (20Marks)

OR

- 6 A Rectangular beam of size 250 mm × 600 mm of effective simply supported span of 7m has to support service load of 26.25 KN.m excluding self weight. The effective cover is 50mm. Design the beam for flexure and shear sketch the reinforcement details. Use M20 grade concrete and Fe415 grade steel. Use  $f_{sc} = 352 \text{ N/mm}^2$ . (20 Marks)

**Module-4**

- 7 Design a reinforced concrete slab for a room of clear dimension  $4\text{m} \times 5\text{m}$ . The slab is supported all around on walls of width 300 mm. The slab has to carry a live load of  $4\text{ KN/m}^2$  and floor finish  $1\text{ KN/m}^2$ . Use M20 grade concrete and Fe415 grade steel. Assume all corners are held down, check section for shear & deflection. Sketch the details of reinforcement. (20 Marks)

**OR**

- 8 Design a dog legged stair for an office building in a room measuring  $2.8\text{m} \times 5.8\text{m}$ , clear vertical distance between the floors is 3.6m, width of flight is to be 1.25 m. Allow a live load of  $3\text{ KN/m}^2$ . Sketch the details of reinforcement of one flight. Use M20 grade concrete and Fe415 grade steel. Assume the stairs are supported on 230mm walls at the end of outer edges of landing slabs. (20 Marks)

**Module-5**

- 9 a. Design the reinforcement for a short axially loaded square column of size  $300\text{mm} \times 300\text{mm}$  to support a load of 1000 KN. Use M20 grade concrete and Fe415 grade steel. (10 Marks)
- b. A column of size  $300\text{ mm} \times 400\text{mm}$  has effective length of 3.6m and is subjected to  $P_u = 1100\text{ KN}$  and  $M_u = 150\text{ KN-m}$  about major axis. Design the column using M25 concrete and Fe415 steel. Assume effective cover of 60mm and provide steel on two sides only. (10 Marks)

**OR**

- 10 Design a square footing for short axially loaded column of size  $300\text{mm} \times 300\text{mm}$  carrying 600 KN load. Use M20 concrete and Fe415 grade steel. SBC of soil is  $180\text{KN/m}^2$  sketch the details of reinforcement. (20Marks)

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