

Code No: 5620AF

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I Semester Examinations, July/August - 2021

ADVANCED REINFORCED CONCRETE DESIGN

(Structural Engineering)

Time: 3 Hours

Max. Marks: 75

Answer any Five questions
All questions carry equal marks

Note: IS 456 – 2000 and Pu-Mu charts are permitted.

1. A floor system consists of a slab 110 mm thick, cast integrally on beams spaced at 3 m centre to centre and spanning over 6.3 m. The beam has a width of 300mm and the total depth of the beam including the thickness of slab is 560 mm. Assume mild exposure condition. The floor is to be designed for a service load of 4 kN/m^2 and 0.9 kN/m^2 for finishes excluding the self-weight of the floor system. Design one intermediate T-beam using Limit State method. Use M 25-concrete and Fe500 steel. [15]
2. A reinforced concrete beam 500 mm deep and 230 mm wide is reinforced with 8 Nos.- 20 mm diameter bars at mid span to carry a UDL of 22.5 kn/m (inclusive of its own weight) over simple span of 8 m. Assuming concrete grade M20, steel grade Fe415, load factor 1.5 and width of support 230mm (a) determine the minimum development length required for 20mm diameter bar to develop full strength (b) apply check for flexural development length at support assuming all bar to continue at support (c) determine the minimum number of bars required at support for development length of flexure. [5+5+5]
3. A rectangular slab $5 \text{ m} \times 6 \text{ m}$ is simply supported and is isotropically reinforced with 10 mm dia@200 mm c/c both ways at an average depth of 100 mm. The overall depth of slab=130mm. Estimate safe permissible load on the slab using yield line theory. Use M 20 concrete and Fe 415 grade steel. [15]
4. Design a continuous RC slab for a hall $5.0 \text{ m} \times 12.5 \text{ m}$. The slab is supported on RCC beams, each 240 mm wide which are monolithic. The ends of the slab are supported on walls, 300 mm wide. Assume the live load of 2 kN/m^2 and weight of floor finishing of 1.5 kN/m^2 . Use M 20 concrete and Fe 415 grade steel. [15]
5. Using direct design method, design an interior panel of $10 \text{ m} \times 10 \text{ m}$ wide flat slab, simply supported at the periphery, by a masonry wall of 230 mm thick. Assume a live load of 4 kN/m^2 and finish load of 1.5 kN/m^2 . Use M30 concrete and Fe 415 grade steel. Sketch the reinforcement details. Assume moderate exposure condition. [15]
6. Find the suitable dimension of a simply supported waffle slab of span 6.5m to be made from the structural hollow clay blocks $300\text{mm} \times 300\text{mm} \times 250\text{mm}$ height with 20m all thickness. Determine the reinforcements required if the slab is to carry an imposed load of 4.0kN/m^2 . [15]

7. A single span deep beam has an overall depth of 4 m and an effective span 6.3 m. The width of the beam is 400 mm. The supports an UDL of 325 kN/m over the entire span. Use M 30 grade concrete and Fe 415 grade steel. Sketch the Reinforcement details. [15]
8. Design a biaxial eccentrically loaded rectangular column for the following data
Ultimate axial load = 1600 kN
Ultimate biaxial moment $M_{ux} = 70 \text{ kNm}$, $M_{uy} = 50 \text{ kNm}$.
Assume an un-supported length of 7m and effective length of 0.85 in both directions.
Use M 20 and Fe 415. [15]

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