TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Design of RCC Structure *(CE 702)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ ***Use design codes IS 456, IS 1893, IS 13920 are allowed and SP16 is allowed to column design only.***
- ✓ *Assume suitable data if necessary.*

1. A rectangular RC beam of overall dimensions 300 mm × 500 mm is reinforced with 4-25 mm dia. bars in tension at an effective cover of 50 mm. The beam is simply supported over an effective span of 5m. Calculate the total uniformly distributed load the beam can carry inclusive of its self weight. Use working stress method of design. Adopt M20 concrete and Fe415 grade (TOR) steel. [8]

   b) A T-beam of effective flange width of 1600 mm, depth of flange 110 mm, breadth of web 300 mm and overall depth 460 mm is reinforced with 4-20 mm bars in tension at an effective cover of 40 mm. Determine the moment of resistance of the section using M20 grade concrete and Fe415 grade steel in Limit state method of design. [8]

2. a) Derive the formula $L_d \leq 1.3 \frac{M_1}{V} + L_0$, where the symbols have their usual meanings. [6]

   b) Design an isolated footing to carrying an axial factored load of 1600 kN. The column is 400 mm by 400 mm in size with 20 mm dia longitudinal bars. The bearing capacity of soil is 180 kN/m^2. For footing, adopt M20 grade concrete and 415 grade HSD bars. Check for shear is necessary. [10]

3. Design a slab for a room of size 5 m × 4 m for a live load of 4 kN/m^2 and floor finish of 1.2 kN/m^2. The slab is supported on 250 mm thick brick masonry walls with two adjacent edges discontinuous. Use M20 grade concrete and Fe415 grade bars. Carry out all checks required for the slab design. Sketch the reinforcement detailing plan and sectional view. Also sketch the torsional reinforcement if required. [16]

4. a) Determine the longitudinal and transverse reinforcements in a short RC column subjected to factored axial load of 1400 kN and factored moment M_{ux} of 200 kN-m and M_{uy} of 110 kNm. The size of the column is 300 mm × 400 mm and unsupported length of 3m. Adopt M20 concrete and Fe500 grade (TMT) bars. Also, do the ductile detailing of transverse reinforcements. [12]

   b) Define development length. Why splices are required in RCC structure. [4]

5. a) Explain how a RC structural member subjected to bending, shear and torsion is designed by IS code method. [5]

   b) Write down the provisions of ductile detailing for columns with neat sketches. [6]

   c) Describe methods of controlling deflection and crack width in RCC structures. Describe the empirical formula for calculating the design surface crack width. [3+2]

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