

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
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.
- ✓ Assume suitable data if necessary.



1. a) Describe the difference between working stress and limit stress design. Explain characteristic strength and load. [2+2]
- b) Derive equations for bending moment carrying capacity of double reinforced rectangular section using assumptions for working stress method given by IS 456:2000. [6]
- c) A simply supported RCC beam of effective span 4 meter and overall dimensions 250 mm × 475 mm is subjected to superimposed load of 45 kN/m excluding its self-weight with point load 75 kN at midspan. Design the beam for limit state of collapse in flexure. Also, check whether the beam is safe in deflection or not. Consider effective cover to be 45 mm, Take M 25 concrete and TMT bars. All the loads are in service level. [10]
2. a) A simply supported RCC beam 300 mm wide and 400 mm deep (effective) is reinforced with a 4-20 mm diameter bars. Design the shear reinforcement if M 25 grade of concrete and TOR steel bars is used and beam is subjected to a shear force of 130 kN and torsional moment 45 kN-m at service state. [10]
- b) A rectangular slab panel 5m × 4 m (clear span) is continuous over three edges and discontinuous over one short edge. The slab is to rest on 250 mm wide beam. The slab is subjected to live load of 4 kN/m² and floor finish of 1.5 kN/m². Design the slab and check whether the provided section satisfies the deflection criteria. Also, sketch the arrangement of reinforcement bars at the support and at the midspan with torsional bars. [10]
3. a) Define development length and lap splice. Derive the expression $L_d \leq 1.3 \frac{M_1}{V_u} + L_0$ at simply supported end, where symbols have their usual meaning. [2+4]
- b) Design an unbraced rectangular RC column having clear height 6.0 m, with x-sectional dimension 400 mm × 350 mm subjected to design axial load of 600 kN, design bending moments 100 kNm about major axis and 50 kNm about minor axis. Consider M20 concrete and Fe 415 steel. [14]
4. a) Discuss about requirements for good detailing. Also describe bar bending schedule. [3+3]
- b) Design a footing for a rectangular column of size 30 cm × 35 cm reinforced with 8-20 mm dia. bars. The column is subjected to a factored axial load and moment of 1000 kN and 80 kN-m, respectively. The allowable bearing capacity of soil is 140 kN/m². At a depth of 1.6 m. Use M25 concrete and TMT bars for column and footing both. Sketch all of the reinforcement required. [14]