

TRIBHUVAN UNIVERSITY  
INSTITUTE OF ENGINEERING  
**Examination Control Division**  
2078 Bhadra

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

**Subject: - Design of Reinforced Concrete Structures (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 of IS 456, IS 1343, IS 13920 are allowed. IS 456 SP-16 is allowed to design column only.

✓ Assume suitable data if necessary.

1. a) Define characteristics loads and characteristic strength. Discuss stress strain relation for steel and concrete in Limit State Method (LSM) and Working Stress Method (WSM). [1+1+2+2]
- b) An R.C.C beam 25 cm wide and 60 cm deep has 4 bars of 20 mm dia. as tension reinforcement. The centre of bars being 5 cm above the bottom of the beam. Determine the uniformly distributed load the beam can carry over a simply supported effective span of 6.10m. The permissible stresses in concrete and steel are taken as 7 MPa and 230 MPa respectively. Use modular ratio. [8]
- c) What are the factors affecting the ductility. Explain the ductility requirements of R.C.C. beam as per IS 13920. [6]
2. a) Explain about behaviour of concrete under shear with sketches. Explain the different conditions. [4]
- b) Design a two adjacent sides (edges) discontinuous reinforced concrete slab for room having clear dimensions of 3.5m × 4.5m. The slab rest on 250mm wide beam. Consider 25mm thick PCC floor finish and live load on slab as 4.0kN/m<sup>2</sup> and partition wall load on slab as 1.0kN/m<sup>2</sup>. Use M20 concrete and Fe415 steel. Check also the slab safe in shear deflection or not. Show the reinforcement and arrangement in plan and section (along short span only). (Design of Torsional reinforcements in slab not required). [16]
3. a) Determine the longitudinal and transverse reinforcements to be provided in a biaxially loaded short square shaped RCC column with following data:  
Size of column = 400×400mm.  
Ultimate factored axial load = 800kN  
Inclusive of live load at an eccentricity of 80mm in both X and Y direction.  
Use concrete grade of M20 and steel grade of Fe415. [10]
- b) Explain about bond and development length with formula derivation. [5]
- c) Explain the design steps of flange beams. [5]
4. a) Design an isolated square footing foundation of uniform thickness for a 400mm×400mm column subjected to an axial load of 650kN at service state. Consider safe bearing capacity of soil as 170 kN/m<sup>2</sup> and concrete of M20 and steel grade of Fe500. Show the reinforcements in plan and in section of footing. [12]
- b) A simply supported normal T beam of 6m clear span with service load of 40kN/m. It is reinforced with 4 numbers of 20mm diameter bars at support. Design the shear reinforcement near the support considering the shear contribution of 2 numbers of 20mm dia bars near support. The beam has cross section of 300mm×600mm overall. Use M20 concrete and Fe 415 steel. [8]