

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

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.
- ✓ Assume suitable data if necessary.



1. a) What are balanced, under-reinforced and over-reinforced sections? Explain with neat sketches of the stress distributions and expressions for moment resistance of each section. [6]
- b) An RC beam 230 mm wide and 400 mm deep (effective depth of 380 mm with area of steel 580 mm² has permissible stress in concrete and steel 5 N/mm² and 140 N/mm² respectively. Find the moment of resistance of the section and actual stresses in concrete and steel. [8]
- c) Explain about design steps of doubly reinforced section with neat sketches. [6]
2. a) An RC beam with effective depth of 550 mm and breadth of 400 mm contains 5#25 mm diameter bars, out of which two bars are to be bent-up at 45° near the end of the support. The beam carrying a uniformly distributed factored load of 100 kN/m over a 6 m clear span. Calculate the shear resistance of the bent-up bars and design the additional stirrups if needed. Use M20 grade concrete and Fe415 grade steel. [10]
- b) Design column 400 mm × 500 mm having unsupported length of 4.0 m with both ends effectively held and restrained against rotation at one end with the following data: [10]

Factored axial load = 1600 kN
Factored moments = 150 kN-m and 50 kN-m
Use M25 concrete grade and Fe500 steel grade.
3. a) Design a reinforced concrete rectangular slab of size 4.0 m × 5.0 m to support an imposed load of 4 kN/m² and floor finish of 1 kN/m². The slab has two adjacent edges discontinuous with the slab resting on 275 mm wide beam. Check the safety of slab against shear and deflection. Use M20 grade concrete and Fe415 grade steel. (Design of torsional reinforcements is not required) [12]
- b) What is the philosophy of design of structures in earthquake prone region? Explain about design for strength and ductility. [4+4]
4. a) Design an isolated footing for a 450 mm × 500 mm sized column, with 6#20 mm diameter bars. Carrying factored axial load of 1100 kN and factored uniaxial moment of 120 kN-m at the column base. Take the depth of footing 1.5 m and safe bearing capacity of soil 100 kN/m². Use M20 grade concrete and Fe500 grade steel. [12]
- b) Explain about ductile detailing in beams and columns. Why ductile detailing is needed in joints? [4+4]