TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 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**.*
- ✓ ***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) Explain with suitable diagrams balanced under-reinforced and over-reinforced sectors in RCC design. [6]

   b) Discuss about under re-inforced and over re-inforced RC sections with their significance during design with suitable sketches. [4]

   c) A simply supported beam has clear span 4.5 m, support width 200 mm is subjected to imposed load of 35 kN/m. Beam is also subjected to torsional moment 18 kNm, consider M20 concrete and Fe415 steel. Design for bending and shear. [10]

2. a) Discuss shear carrying mechanism of reinforced concrete structure with neat sketches. [4]

   b) Design an interior pannel of a slab for a room having clear floor finish dimension of 3.5 × 4.5 m. The slab rests on 250 mm wide beam. Assume liveload of 4 kN/m^2 and of 0.6 kN/m^2. Use M20 mix and Fe415 grade of steel. Check for shear and deflection is also required. Draw reinforcement detailing in plan and sections. [16]

3. a) Determine the reinforcement in short column has 4 m length fixed in both sides with bi-axially loaded having a following parameters: [10]

   Size of column = 400 mm × 600 mm; Factored load, Pu = 1000 kN;
   Factored moment Mux = 125 kNm; Factored moment Muy = 200 kNm;
   M25 concrete and Fe500 steel

   b) Determine the moment of resistance of a RC rectangular beam of overall dimension 250 mm × 475 mm reinforced with 3-16 mm dia. bars in tension side. Use M20 concrete Fe415 steel in working stress method. Also, discuss about the actual and theoretical point of curtailment of re-bar. [6+4]

4. a) Design a RC footing for a column having x-sectional dimension 400 mm × 300 mm, with 8-16 ϕ longitudinal reinforcement, column is subjected to axial compressive load of 1000 kN and reversible bending moment 100 kNm. Consider M20 concrete for footing, M25 concrete for column and Fe415 steel for both. Take safe bearing capacity of soil is 200 kN/m^2 at a depth of 1.5 m. [12]

   b) Explain the empirical method of controlling deflection as per IS 456. [4]

   c) Discuss how ductility of RC structure can be increased. [4]

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TRIBHUVAN UNIVERSITY
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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 <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ ***<u>Use of IS 456, IS 1343, IS 13920 are allowed. IS 456 SP-16 is allowed to design column only.</u>***
- ✓ *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 an slab as 4.0KN/m^2 and partition wall load on slab as 1.0kN/m^2. 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 thicknesss 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^2 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]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

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.*
- ✓ *Use design codes IS456, IS1893, IS13920 are allowed.*
- ✓ *SP16 is allowed for column design only.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe about the requirement of steel as reinforcement in RCC structure. Explain about moment of resistance of doubly reinforced section. Derive the formula. [2+2+4]

   b) Calculate the tensile reinforcement required for a rectangular RC beam of size 230mm×425mm (overall) if it has to carry a moment of 64KNm at service condition. Use M20 grade concrete mix and Fe500 grade steel in working stress method. [8]

2. a) Describe the method of controlling deflection and cracking in RCC structure. [2+2]

   b) Determine the longitudinal and transverse reinforcement of RC column subjected to a factored axial load of 1440KN and factored moment Mux about major axis of 195 KNm and Muy about minor axis 180KNm. The size of column is 350mm × 350mm and unsupported length of 3.60m. Adopt M20 concrete and Fe500 grade (TMT) steel. Also do the ductile detailing of transversal reinforcement. [12]

3. a) Define development length and ductility. Describe the ductility requirements in different joints of RCC structure. [1+1+4]

   b) A RC beam has an effective depth of 550mm and a breadth of 300mm. It contains 4 no. of 20mm dia bars out of which two bars are to be bent up at 45° near end of the support. Calculate the shear resistance of bent up bars and the additional stirrups needed if the factored shear force due to uniformly distributed load is 425KN at the support. The span of the beam is 6m. Use M20 grade concrete mix and Fe415 grade (TOR) steel. [10]

4. a) Define balanced, under-reinforced and over-reinforced sections. [3]

   b) Design a RCC footing to carry a column load of 1250KN from 400×400mm square column having 20mm diameter bar as longitudinal steel. The bearing capacity of soil is 140KN/m^2. Consider the depth of foundation as 1.8m. Take unit weight of earth as 18KN/m^3. Use M20 grade concrete mix and Fe415 grade steel. Also sketch the reinforcements in plan and section. [13]

5. a) What is splicing and why it is required in RCC structures. [2]

   b) Design a RC slab over a room 5m×6m. The slab is supported on masonry walls all round with adequate restraint and corners are held down. The live load on slab is 3KN/m^2 and floor finish 1.5KN/m^2. The thickness of supporting wall is 230mm. Use M20 concrete mix and Fe415 grade steel. Also draw the tp and bottom reinforcement detailing with their section and plan. Check for deflection and development length is necessary. [14]

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2075 Chaitra

Exam.	Regular / 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.*
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- ✓ ***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) Explain with the help of sketches, under-reinforced, over-reinforced and balanced sections. [4]

   b) What are the serviceability requirements in the limit state design of RC structures? Explain them briefly. [4]

   c) A rectangular RC beam of overall dimensions 250mm × 450mm is reinforced with 4-16 mm dia. bars in tension at an effective cover of 40mm. Calculate the moment of resistance of the beam using working stress method. Adopt M20 concrete and Fe415 grade steel. [8]

2. a) A reinforced concrete rectangular beam has an overall depth of 500mm and breadth of 300 mm. It consists of 5-25 mm dia bars in tension and 3-16 mm dia bars in compression. Calculate the shear reinforcement needed for a factored shear force of 370 kN. Take M20 grade concrete and Fe415 grade (TOR) steel. Also check the spacing for minimum shear reinforcement. [8]

   b) A rectangular RC beam of overall dimensions 650 mm by 300 mm is subjected to a factored bending moment of 85 kN-m, factored shear force of 110 kN and factored twisting moment of 25 kN-m. Design the beam for longitudinal and transverse reinforcements. Use M25 grade concrete and Fe415 grade steel. [8]

3. a) Design a short rectangular column of size 350mm × 500mm and unsupported length of 3.30m subjected to an axial factored load of 1500 kN and factored moments 130 kN-m and 80 kN-m about major and minor axes respectively. Adopt M30 grade concrete and Fe500 grade steel. Sketch the reinforcement details. [14]

   b) Define development length and lap splice. [2]

4. Design a RCC slab for a room of clear dimensions 6m × 4m whose one short edge is discontinuous and corners are restrained at supports. The live load on the slab is 4 kN/m^2 and superimposed load of 1.20 kN/m^2. Adopt M20 grade concrete and Fe415 grade steel. Check the slab for deflection, and development length. Give the detail sketches, sectional view along short span with reinforcement details along with torsional reinforcements. [16]

5. a) Design a R.C.C isolated footing to carry an axial load of 1500 kN. The column is 350mm ×350mm in size with 20mm diameter, 8 Nos longitudinal bars. The bearing capacity of soil is 175 kN/m^2. Use M20 grade concrete and Fe415 grade steel. Assume missing datas. [10]

   b) Explain with the help of sketches the ductile detailing of RC beams. [6]

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