II B. Tech II Semester Supplementary Examinations, December - 2022
THEORY OF STRUCTURES
(Agricultural Engineering)

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks

UNIT-I

1. a) Explain the limiting moment of resistance and give the expression for the Fe250 and Fe415 grade steel. [7M]
   b) Find the moment resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 3 bars of 16 mm dia. of Fe 415 steel. Take M20 concrete. [7M]

Or

2. a) A doubly reinforced R/C beam 300x600mm (effective depth) carries factored moment 450kN-m. Find the area of steel (compressive and tensile steel). Assume cantilever beam with moderate exposure condition Use M20 concrete Fe500 HYSD steel. [7M]
   b) Draw the stress block parameters of the rectangular R/C beam in the limit state method. Also define the terms Limit state collapse and Limit state serviceability conditions. [7M]

UNIT-II

3. a) Under what situations do the following modes of cracking occur in reinforced concrete beams: (i) flexural cracks, (ii) diagonal tension cracks, (iii) flexural-shear cracks and (iv) splitting cracks? [7M]
   b) A doubly reinforced beam of rectangular section 300mm wide x500mm overall depth is reinforced with 4 bars of 20 mm diameter on the tension face and 2 bars of 16 mm diameter on the compression face. Assume moderate exposure conditions. The beam spans over 9 m. Check the deflection control if Fe 415 steel is used. Use M25 concrete. [7M]

Or

4. a) What do you understand about nominal shear stress? Write the formula for uniform formulae for the rectangular section? [7M]
   b) A rectangular beam 230mm wide is subjected to the following at section: [7M]
      i. Sagging bending moment of 25kNm.
      ii. Shear force of 20kN.
      iii.   Torsional moment of 30kNm.
      Use M25 and Fe-415 steel. Design a suitable section and find the reinforcement required in the section.

UNIT-III

5 a) Explain the different types of shear reinforcement with neat sketches.   [7M]

   b) A simply supported beam 300 mm x 600 mm (effective) is reinforced with 5 bars   [7M]
       of 25 mm diameter. It carries a uniformly distributed load of 80 kN/m (including its
       own weight) over an effective span of 6 m. out of 5 main bars can be bent up safely
       near the supports. Design the shear reinforcement for the beam. Use M20 grade of
       concrete and Fe415 steel.

Or

6 a) What is nominal shear reinforcement? Give the reasons for providing minimum   [7M]
       shear reinforcement.

   b) A R.C.C beam 200 mm x 400 mm effectively carries a uniformly distributed load of   [7M]
       70 kN/m clear span of 6 m. the beam is reinforced with 1%steel on the tension side.
       Comment on the shear design of the beam. Use M20 concrete and load factor = 1.5.

UNIT-IV

7 a) Explain the need for corner reinforcement in two-way rectangular slabs whose   [7M]
       corners are prevented from lifting up.

   b) Design a simply supported slab to cover a hall with internal dimensions 4.0 m×   [7M]
       6.0 m. Theslab is supported on masonry walls 230 mm thick. Assume a live load
       of 3 kN/m^2 and a finish load of 1 kN/m^2 . Use M 20 concrete and Fe 415 steel.
       Assume that the slab corners are free to lift up.

Or

8 a) Design a simply supported RCC slab for a roof of a hall 5m x 10 m with 230 mm   [7M]
       walls all around assume a LL of 4 KN/m^2 and finish 1 KN/m^2. Use M 25 and
       Fe 415 steel.

   b) Design a two-way slab for a room of size 4 m X 5 m with discontinuous and   [7M]
       simply supported edges on all the sides with corners prevented from lifting to
       support a live load of 4kN/m^2. Use M20 grade concrete & Fe415 steel bars.

UNIT-V

9 a) Write the design procedure for slender columns for both braced and unbraced   [7M]
       columns.

   b) A concrete column of 400mm diameter, reinforced with 8 bars of 20 mm diameter   [7M]
       bars is braced & hinged at both ends, 8 m apart. Check the safety of the column if it
       carries a factored axial load of 1100 kN. Use M20 grade concrete & Fe 415 grade
       steel. Assume d' = 60 mm.

Or

10 a) A short column, 600 mm × 600 mm in section, is subject to a factored axial load of   [7M]
       1500 kN. Determine the minimum area of longitudinal steel to be provided,
       assuming M 20 concrete and Fe 415 steel.

   b) Design the longitudinal and lateral reinforcement in a rectangular reinforced   [7M]
       concrete column of size 400 mm X 300 mm subjected to a design ultimate load of
       1200 kN and ultimate moment of 200 kNm with respect to major axis. Adopt M 20
       grade concrete & Fe 415 steel bars.