R20

SET - 1

II B. Tech II Semester Regular Examinations, June/July - 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
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UNIT-I

1 a) Enumerate the five limit states commonly used in limit state design and state briefly how they are provided in the design.   [7M]

   b) A reinforced concrete beam of a rectangular section 300 mm wide by 600 mm deep is reinforced with 4 bars of 25 mm diameter at an effective depth of 550 mm. The effective span of the beam is 7m, f_y = 415 N/mm^2 and f_{ck} = 20 N/mm^2, find the uniformly distributed ultimate load on the beam.   [7M]

Or

2 a) Find out the ultimate moment of resistance of a rectangular beam 300 mm x 550 mm. The area of tension and compression reinforcement is 250mm^2 and 400 mm^2 respectively. Take an effective cover as 50 mm. Assume M 25 grade of concrete and Fe 415 steel.   [7M]

   b) Draw the cross-section of a singly reinforced rectangular beam and show the strain and stress diagrams.   [7M]
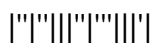
UNIT-II

3 a) Explain the terms balanced, over-reinforced and under-reinforced section in bending. Explain which of these should be recommended in design.   [7M]

   b) Design balanced singly reinforced concrete beam section for an applied moment of 60 kNm, the width of the beam is limited to 175 mm. use M20 concrete and Fe 415 bars.   [7M]

Or

4 a) What do you mean by neutral axis and lever arm? Explain briefly with neat sketches.   [7M]

   b) Design a doubly reinforced simply supported beam resting on walls of 300 mm thick & 6.5 m c/c. The beam has to carry a live load of 15 kN/m & dead load of 9 kN/m. The size of the beam is 300 mm X 500 mm and has to carry a point load of 40 kN at 2m from left support. Assume 30 mm clear cover and M25 grade concrete.   [7M]

UNIT-III

5 a) Explain the Step by step design procedure for shear reinforcement.   [7M]

   b) A simply supported reinforced concrete beam is 250 mm wide and 500mm effective depth and is reinforced with 4-20 mm diameter as tensile steel. If the beam is subjected to a factored shear of 65 kN at the support. Find the nominal shear stress at the support. Use M20 concrete and Fe 250 steel.   [7M]

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Or

6 a)   What are the IS 456:2000 code requirements for bond?   [7M]

   b)   An R.C.C. Beam 250 x400 mm effective depth is carried a uniformly distributed   [7M]
         load of 15kN/m. The beam is reinforced with 4 bars of 22 mm dia. The clear span
         of the beam is 4m. Design the shear reinforcement; use M 20 concrete and plain
         mild steel bars.

UNIT-IV

7 a)   Explain the difference in the behavior of one-way and two-way slabs.   [7M]

   b)   Design a simply supported slab to cover a hall with internal dimensions   [7M]
         4.0 m × 6.0 m. The slab 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)   Write the procedure for design two way simply supported slabs.   [7M]

   b)   Design continuous RC slab for a hall 6.5 m wide and 13.5 m long. The slab is   [7M]
         supported on rcc beams, each 240 mm wide which are monolithic. The ends of
         the slab are supported on walls 300 mm wide. Design the slab for LL of 2 kN/m^2
         assume weight of roof finishing equal to 1.5 kN/m^2 use M20 grade concrete and
         Fe 415 grade steel.

UNIT-V

9 a)   Derive the expression for the ultimate load for axially loaded short columns.   [7M]

   b)   Determine the longitudinal steel required for column for 400 x 600 mm   [7M]
         carrying Pu=166 kN, factored moment M (major axis) =120 kN-m and
         factored M (minor axis) = 90 kN-m, assume fck =15 N/mm^2, fy =415 N/mm^2 ,
         'd'=60mm.

Or

10 a)   Explain the step-by-step procedure for design of centrally loaded short columns.   [7M]

    b)   Design the reinforcements in a circular column of diameter 300 mm to support a   [7M]
         service axial load of 800 kN. The column has unsupported length of 3 m and is
         braced against side way. The column is reinforced with helical ties. The material
         to be used is M 25 grade of concrete and HYSD steel bars of grade Fe 415.