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DECEMBER 2021 - ENDSEM EXAM
T. Y. B. TECH. (CIVIL) (SEMESTER - I)
COURSE NAME: Structural Design and Drawing - I
COURSE CODE: CVUA31182
(PATTERN 2018)

Time: [1.5 Hr.]

[Max. Marks: 30]

Instructions to candidates:

- 1) Answer Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6.
- 2) Figures to the right indicate full marks.
- 3) Use of IS 456:2000, Interaction curves from SP16 and calculator is allowed
- 4) Assume suitable data if required

Q.1 a The tread depth of a step is 250 mm, the going depth of a step is 250 mm, the rise height of a step is 150mm and the depth of waist slab is 150 mm. The thickness of floor finish is 15 mm. Take unit weight of reinforced concrete as 25.0 kN/m^3 and unit weight of floor finish as 23.5 kN/m^3 . Calculate the weight of each step (including waist) per meter width of the staircase. [4]

Q.1 b Design a simply supported one way slab over a room 2.8 m x 6 m effective, carrying L.L. of 4 kN/m^2 and F.F. of 1.5 kN/m^2 . Use M20 and Fe 500 materials. [6]

OR

Q.2 a A simply supported slab having effective span of 6 m x 5 m is subjected to a super-imposed load of 7 kN/m^2 inclusive of its self-weight, finish etc. and an imposed load of 4 kN/m^2 . Considering limit state method of design, calculate area of torsional steel required at corner of the slab. Consider section as balanced; grade of concrete and steel are M25 and Fe415 respectively. [4]

Q.2 b Design a cantilever slab for effective span of 1.3 m carrying L.L. of 3 kN/m^2 and F.F. of 1 kN/m^2 . Use M20 and Fe 415 materials. [6]

Q.3 a A square isolated footing (size :1800 mm x 1800 mm) is made for a square column of size 300 mm x 300 mm to transfer the ultimate load, $P = 1400 \text{ kN}$ to the ground. The overall depth of footing is 450 mm. The clear cover is 40 mm. The diameter of reinforcement provided is 12 mm. Show the check for one way shear for the footing. [4]

- Q.3 b Design the reinforcement in a column of size $500 \text{ mm} \times 650 \text{ mm}$, subjected to a factored axial load of 3000 kN . The column has an effective length of 3.0 m in both directions. Use M 20 concrete and Fe 415 steel. [6]

OR

- Q.4 a Calculate the diameter of lateral ties and maximum spacing between two lateral ties for a column of size $250 \text{ mm} \times 350 \text{ mm}$, if diameter of longitudinal bars is 20 mm . [4]

- Q.4 b An isolated pad footing for a column 230 mm wide and 650 mm deep is subjected to axial working load of 1500 kN . The safe bearing capacity of the soil is 300 kN/m^2 . Calculate the dimensions of footing if M25 & Fe 415 materials are used. [6]

- Q.5 a "High strength concrete and steel is used in prestressed concrete", justify. [4]

- Q.5 b Discuss with suitable sketch basic concepts of prestressed concrete. [6]

OR

- Q.6 a Enlighten the basic principle and enlist any six applications of prestressed concrete [4]

- Q.6 b Estimate and develop resultant stress diagram at service load at mid-span section of a pre-tensioned beam $250 \text{ mm} \times 500 \text{ mm}$, subjected to initial prestressing force of 1500 kN and a uniformly distributed superimposed load of 5 kN/m over a span of 15 m . Total loss of prestress is 12% and eccentricity of prestress at the mid-span is 100 mm . [6]