

B.Tech. (Sem. - 5th)**DESIGN OF CONCRETE STRUCTURES - I****SUBJECT CODE : CE - 307****Paper ID : [A0615]**

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours**Maximum Marks : 60****Instruction to Candidates:**

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A**Q1)****(10 × 2 = 20)**

- a) Distinguish between term 'factor of safety' and 'partial safety factor'.
- b) Explain the necessity for specifying max and min tension steel in reinforced beams. What are their values?
- c) Enumerate at least three situations in which doubly reinforced beams become necessary.
- d) Derive the equation of M.O.R for under-reinforced flanged beams.
- e) What is meant by equivalent length of a column.
- f) Span/depth ratio can be used to control deflection in beams. Justify.
- g) What are the codal recommendations of torsion steel in Two-way slab.
- h) Shear stress carrying capacity of slab is more than beams. Justify.
- i) What is the difference between lap length and anchorage length.
- j) Interaction diagrams are convex outwards. Explain.

Section - B**(4 × 5 = 20)**

- Q2)** A doubly reinforced beam 250mm × 450mm is reinforced with 4#25mm on tension side and 4 # 18mm on comp. Assume an effective cover of 50mm. $f_{ck} = 20$ and $f_y = 415$. Calculate ultimate moment carrying capacity of the section.

- Q3)** Determine the approximate position of NA at ultimate load of a T-beam. $B_f = 750\text{mm}$. $B_w = 250\text{mm}$, $D_f = 120\text{mm}$, $d = 450\text{mm}$ $A_{st} = 3500\text{mm}^2$. $f_{ck} = 15$ $f_y = 415$.
- Q4)** An R.C.C section $200\text{mm} \times 400\text{mm}$ is subjected to a character stick twisting moment of 2.5kNm and transverse shear of 600kN . Assume $f_{ck} = 25$ and $f_y = 415$. Determine shear reinforcement required.
- Q5)** A rectangular column of effective height 4m is subjected to a character stick axial load of 800kN and bending moment of 100kNm about the major axis of the column. Design a suitable section for the column so that the width should not exceed 400mm . Use min. % of longitudinal steel. Assume $f_{ck} = 20$ and $f_y = 415$.
- Q6)** A reinforced concrete slab is to span room of $3\text{m} \times 8\text{m}$. the slab is subjected to live load of 4kN/m^2 . Design R.C.C slab using M20 concrete and $f_y = 415$.

Section - C

(2 × 10 = 20)

- Q7)** A staircase of 1.2m width for an office building consists of each step built into wall with a bearing of 110mm along the flight with tread = 250mm and rise = 200mm . Design the staircase and sketch layout of reinforcement, $f_{ck} = 20$, $f_y = 415$.
- Q8)** Design the exterior panel of a two way slab for an office floor continuous over T-beams spaced at 4m centres. Adopt $f_{ck} = 20\text{N/mm}^2$ and $f_y = 415$. Corners held down.
- Q9)** A short column 250mm square has to carry an ultimate axial load of 600kN along with ultimate moment of 60kNm about one axis and 40kNm on another axis. Assuming $f_{ck} = 30$ and $f_y = 415$. Design longitudinal steel.

