Paper ID [A0615]

(Please fill this Paper ID in OMR Sheet)

B. Tech. (Sem. - 5th)

DESIGN OF CONCRETE STRUCTURES - I (CE - 307)

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 'Factor of safety' and 'Partial Safety Factor'.

b) Explain the necessity for specifying maximum and minimum tension steel in reinforced beams.

c) Why do specifications state that atleast 50 percent of the shear to be carried by steel should be in the form of stirrups?

d) Define effective length of a column.

e) Distinguish between the failure patterns of reinforced concrete short & long columns.

f) What is equivalent shear as applied to torsion & shear in IS 456?

g) What is meant by 'Dog legged staircase'?

h) What is the minimum horizontal and vertical distance between individual bars of same diameter in a beam?

i) What is the maximum diameter and spacing of reinforcement in two-way RCC slab?

j) If balanced moment of resistance of a beam of width 'b' and effective depth 'd' is expressed as Qbd^2, find the value of Q for M 25 and Fe 415. Also give units of Q.

Section - B

$(4 \times 5 = 20)$

Q2) Design a singly reinforced beam to suit the following data:

Clear Span = 3 m

Width of supports = 200 mm

Working live load = 6 kN/m

M 20 & Fe 415.

Q3) Design the interior panel of a flat slab for a ware house to suit the following data:

Size of ware house 30 m by 30 m divided into panels 6 m by 6m

Loading class 4.5 kN/m²

M 20 grade concrete and Fe 415 HYSD bars.

Q4) Design the longitudinal and lateral reinforcements in a rectangular reinforced concrete column of size 300 mm by 500 mm to support a factored axial load of 1400 kN. The column has an unsupported length of 3 m and is braced against sidesway in both the directions. Use M 20 and Fe 415 HYSD bars.

Q5) Design one of the flights of stairs of a school building spanning between landing beams. Data given is

Type of staircase : Waist slab type

Number of steps in flight 12

Tread = 300 mm, Riser 160 mm

Width of landing beams = 400 mm

Materials: M 20 concrete Fe 415 steel (HYSD).

Q6) Describe the merits of Limit State Design method over Working Stress Method. Mention the assumptions made in Design based on Limit State.

Section - C

$(2 \times 10 = 20)$

Q7) A rectangular R.C.C. beam is 400×900 mm in size. Assuming the use of M 25 and Fe 415, determine the maximum ultimate torsional moment the section can take if

(a) No torsion reinforcement is provided.

(b) Maximum torsion reinforcement is provided.

E-353

Q8) Explain why IS codes do not insist on the condition $[L_d \ngtr M_1/V + L_o]$ for negative steel at the interior support of a continuous beam. How does one checks the anchorage length of bars in the interior support?

Q9) (a) Indicate the three cases regarding position of neutral axis in the design of T beams.

(b) Determine the area of steel required in a T beam with the following dimensions for an ultimate moment of resistance of 450 kNm. Depth of slab = 120 mm, breadth of flange = 700 mm, breadth of web = 300 mm, total depth 550 mm. M 20 and HYSD Fe 415 are used.