17604

16172

4 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(8) Use limit state method for all design.

(9) Write the answer in sequential order.

Marks

1. (A) Attempt any THREE : **4 × 3 = 12**

(a) Draw the stress block diagram for singly reinforced section.

(b) State any four functions of reinforcement in R.C. sections.

(c) State two advantages and two disadvantages of prestressed concrete.

(d) State various forms of shear reinforcement in beams.

(e) State two ductile detailing provision in IS 13920.

(B) Solve any ONE : **6 × 1 = 06**

(a) A beam 230 mm × 450 mm effective size carries a factored B.M. of 150 kN.m. if concrete M20 and. Steel grade Fe 500 are used, find area of steel.

(b) Find moment of resistance if steel provided is 6 bars of 12 mm diameter in a beam 300 mm × 500 mm effective. Concrete M20 and. Steel Fe 500 are used.

2. Solve any TWO : **8 × 2 = 16**

(a) Design a one-way slab with following data span = 5.0 m, Live load = 4.5 kN/m^2, Floor finish = 1 kN/m^2. Concrete M 20 and steel Fe 415, M.F. = 1.4. sketch c/s of slab showing reinforcement details.

(b) The effective dimensions of a slab panel are 4 m × 7 m. it carries super imposed loads of 4 kN /sqm. Design a suitable slab using. M20 and Fe 415 steel. Take M.F. = 1.25, α_x = 0.113 and α_y = 0.037. Find total depth D factored BM and reinforcement details using suitable bars. Sketch the c/s of slab along shorter span showing reinforcement details.

(c) Design a cantilever chajja with following data :

Span = 1.50 m, width = 2.0 m, L.L. = 1.5 kN/m^2. Floor finish = 0.5 kN/m^2, support lintel = 230 × 300 mm concrete M 20, Fe 415 steel, sketch the c/s of chajja. Showing steel details.

3. Attempt any FOUR : **4 × 4 = 16**

(a) Find the moment of resistance (M_r) of fec (T) beam with following data :

Df = 120 mm, bf = 1500 mm, bw = 300 mm, d = 450 mm, Asf = 2200 mm^2, concrete M25, steel Fe 500.

(b) State the conditions of formation of flanged beams & state effective flange width for T & L beam.

(c) Define development length & state factors affecting development length.

(d) Diameter of a steel bar is 20 mm, steel Fe 415 grade and design bond stress is 1.2 MPa for plain bars in tension, calculate the development length for bars in compression.

(e) Design a rectangular column with following data :

factored load = 3500 kN, concrete M 20, steel Fe 415, Unsupported length = 4.0 m. Assume 1 % steel.

4. (A) Attempt any THREE : **4 × 3 = 12**

(a) State methods of prestressing and explain in brief any one.

(b) Calculate load carrying capacity of column 300 mm in diameter reinforced with 4 – 16 mm ϕ and 6-12 mm ϕ bars use M 20 concrete and Fe 415 steel.

(c) Define :

(i) Characteristic strength and

(ii) Characteristic load.

(d) State four situations where doubly reinforced sections are preferred.

(B) Attempt any ONE : **6 × 1 = 06**

(a) A R.C. beam 230 × 450 mm effective is subjected to a working moment of 150 kN.m. calculate area of steel in tension and compression zone. Use M 20 concrete and Fe 415 steel.

(Assume d' = 45 mm, and for d'/d = 0.1, fsc = 353 MPa)

(b) Find the moment of resistance of a beam 230 mm × 450 mm deep reinforced with 4 – 16 mm diameter bars in tension zone and 2 – 12 mm diameter bars in compression zone. Assume effective cover of 40 mm. use M 20 concrete and Fe 415 steel.

5. Attempt any TWO : **8 × 2 = 16**

(a) A doubly reinforced beam section 230 mm × 450 mm effective carries a factored moment of 175 kN.m. Find the area of steel. required if M 20 concrete and Fe 500 are used. Assume d' = 50 mm and σ_{sc} = 353 N/mm^2.

(b) A beam 250 mm × 415 mm effective depth is reinforced with 4 bars of 16 mm dia of grade Fe 415. The shear force of the support is 90 KN. Design the shear reinforcement. Use M 20 concrete and 6 mm dia vertical stirrups of fe 415 steel.

P.T.O.

% Pt.	0.5	0.75
$Z_c$inMPa	0.48	0.56

(c) Design on R.C. column footing with following data.

Size of column = 400 mm × 400 mm.

Safe bearing capacity of soil = 200 kN/m^2.

Load on column = 1200 kN.

Concrete M $_{20}$ and steel Fe 415 is used.

Calculate depth of footing from B.M. Criteria.

No shear check is required.

6. Attempt any FOUR : **4 × 4 = 16**

(a) Differentiate under reinforced and over reinforced section with reference to area of steel, depth of NA moment of resistance.

(b) Write IS specifications of minimum eccentricity and transverse reinforcement for an axially loaded column.

(c) What is minimum and maximum percentage of tension steel that should be provided in flanged beams as per IS specifications.

(d) Find limiting moment of resistance (Mu) of a T beam with following data, bf = 1500 mm, bw = 230 mm, d = 730 mm, Df = 120 mm, Asf = 2200 mm^2, concrete M 20 & Fe 415 steel.

(e) Calculate the area of longitudinal, steel for short circular column of dia. 300 mm with eff. length 5.0 m to carry a factored load of 1000 kN. Use M 20 concrete & Fe 500 steel.

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