17604

21819

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 designs.

Marks

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

(a) Explain the concept of limit state of flexure. State various limit states.

(b) Define 'characteristic strength' and 'characteristic load'.

(c) Write the requirements of ductility for flexural members as per IS : 13290-1993.

(d) Explain pre-tensioning and post-tensioning.

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

(B) Solve any ONE : **1 × 6 = 6**

(a) A beam having dimension 230 × 450 mm effective is reinforced with 4 bars of 16 mm diameter on tension side. Calculate the ultimate moment of resistance of the beam if M20 grade concrete of Fe415 steel is used.

(b) A beam 300 mm × 500 mm effective size carries a factored bending moment of 175 kNm. If concrete M20 & Steel grade Fe500 are used, find area of steel required.

2. Solve any TWO : 2 × 8 = 16

(a) Design a one way slab with following data, width of support = 230 mm, Clear Span = 3.5 m, Live load = 2 kN/m^2, Floor finish = 1 kN/m^2, Concrete M20 & Steel 415, M.F. = 1.4. Sketch c/s of slab showing reinforcement details (No checks are required).

(b) Design a reinforced concrete slab panel for 6.55 m × 4.35 m simply supported on all four sides. It carries a live load 2 kN/m^2 & Floor finish load 1.0 kN/m^2. Use M20 Concrete & Fe415 Steel. Sketch the c/s of slab along shorter span showing steel details (No checks) Use $\alpha_x = 0.104$, $\alpha_y = 0.046$, Mf = 1.3.

(c) Design a cantilever slab for Chajja with following data. Span = 1.5 m, L.L. = 2 kN/m^2. F.F. = 0.5 kN/m^2, Adopt M20 & Fe415 steel, Modification factor = 1.3.

3. Attempt any FOUR : 4 × 4 = 16

(a) What is flange width of T-beam as per IS:456 ? State meaning of each term used therein.

(b) Find the moment of resistance of (T) beam with following data :

Df = 100 mm, bf = 1200 mm, bw = 250 mm, d = 500 mm, Ast = 1600 mm^2, M25 concrete and Fe415 steel.

(c) Diameter of steel bar is 16 mm, Use Fe 415 and design bond stress is 1.2 mpa. For plain bars in tension. Find development length in tension and compression.

(d) Define the development length. How it is calculated ?

(e) Design an axially loaded column 400 mm × 400 mm pinned at both ends with an unsupported length of 3 m for carrying a factored load of 2500 kN. Use M20 grade concrete & Fe415 steel.

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

(a) State any four losses in prestressing and describe any one.

(b) Calculate working load carrying capacity of column 300 mm × 450 mm in dimension and provided with 8-16 mm diameter bars. Use M20 & Fe 500 steel is made.

(c) State the values of partial factor of safety for steel and concrete.

(d) State four situations where doubly reinforced section is preferred.

(B) Attempt any ONE : **1 × 6 = 6**

(a) An R.C.C. beam 230 mm × 450 mm effective is subjected to a factored moment of 140 kNm. Calculate area of steel in tension and compression zone. Use M20 grade concrete & Fe415 steel. (Assume d′ = 45 mm and d′/d = 0.1 fsc = 353 N/m^2).

(b) A beam 240 mm × 500 mm effective, it is reinforced with 4-16 mm diameter tension side and 2-12 mm in compression zone, each an effective cover of 40 mm. Use M20 concrete & Fe415 steel. Find ultimate moment of resistance. Assume fsc = 352 N/mm^2.

5. Attempt any TWO : **16**

(a) Design a doubly reinforced rectangular beam 300 mm × 660 mm overall size, for an effective span of 5 m. The beam is subjected to udl of 55 kN/m. Assume effective cover 60 mm. Use M20 & Fe415 steel. d′/d = 0.1, fsc = 353 N/mm^2.

(b) A beam 250 mm × 400 mm deep effective is reinforced with 3 bars of 16 mm diameter of grade Fe415. The shear force at the support is 60 kN. Design the shear reinforcement if grade of concrete used is M20. Use 6 mm or 8 mm diameter vertical stirrups.

(c) Design an isolated square footing for a square reinforced concrete column section 250 mm size to carry an axial factored load of 700 kN. The S.B.C. of the soil is 150 kN/m^2. Calculate the depth and steel required of footing from bending moment consideration only. Show reinforcement details. Use M20 & Fe415.

P.T.O.

6. Attempt any FOUR : **4 × 4 = 16**

(a) An R.C. T – beam section reinforced for tension has the following dimension bf = 1250 mm, bw = 300 mm, d = 550 mm, Df = 100 mm, Ast = 1884 mm^2. Use of M20 & steel Fe415 is made. Calculate the limiting moment of resistance.

(b) State the I.S. specification for,

(i) Maximum reinforcement in beams & slabs.

(ii) Minimum reinforcement in slab.

(iii) Minimum shear reinforcement.

(iv) Cover to reinforcement in beam and slab.

(c) Calculate effective flange width for T-beam for following details.

Width of web = 230 mm

Slab thickness = 100 mm

Size of Hall = 12 m × 6 m

Width of support for beam = 230 mm

C/c spacing of beams = 3 m

(d) Write four I.S. specifications for the longitudinal reinforcement in columns.

(e) Calculate the area of longitudinal steel for short circular column of diameter 400 mm with effective length 4.5 m to carry a factored load of 900 kN. Use M20 & Fe500 steel.
