17604

16117

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 and analysis problem.

Marks

1. a) **Attempt any <u>THREE</u> of the following:** **12**

(i) State any four assumption made in design for the limit. State method.

(ii) Draw strain and stress distribution diagram for an under reinforced rectangular section showing all significant values for L.S.M.

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

(iv) State various losses in prestressing. State their approximate percentage loss for post tensioned member.

(v) State any three ductile detailing provision in IS.13920-200.

Marks

b) **Attempt any ONE of the following:** **6**

(i) Find the moment of resistance Mu for a beam 300 × 600 mm effective: provided with 3 bars of 16 mm diameter and 2 bars of 12 mm diameter on tension side. M 20 and Fe 500 are used.

(ii) Calculate depth and area of steel at mid span of a simply supported beam over as clear span 6 m. The beam is carrying all inclusive load 20 kN/m. Assume 300 mm bearings. Use M 20 and Fe 500.

2. Attempt any TWO of the following: **16**

a) A one way slab is to be designed for an effective span 3.3 m. The superimposed load including finishing is 4 kN/m^2. Taking modification factor 1.2. Design the slab. Sketch c/s of slab showing reinforcement detail. Use concrete M 20 and steel Fe 415.

b) Design a simply supported two way slab over a room 4.8 m × 4.0 m effective, subjected to udl 5 kN/m^2 (inclusive of self wt). Use M 20 and Fe 415. Draw reinforcement detail check for shear may not be given. Take $\alpha x = 0.084$ and $\alpha y = 0.059$.

c) (i) Draw detailed diagram showing reinforcement details in case of cantilever slab.

(ii) Draw detailed diagram showing reinforcement details in case of dog-legged staircase.

3. Attempt any FOUR of the following: **16**

a) State the I.S. specifications for effective flanged width of "T" and "L" beam.

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

bf = 1200 mm, Df = 120 mm, bw = 300 mm, d = 500 mm, steel on tension side = 5 bars of 20 mm diameter bars.

Marks

c) Find development length of 20 mm diameter bar in tension and compression. Assume M 20 concrete and Fe 500 grade steel. Use Z_{bd} = 1.2 N/mm^2.

d) State I.S. specification for minimum shear reinforcement in beam.

e) Design a R.C. column to carry an axial working load 400 kN. The effective length of column is 2.5 m. Check the column for minimum eccentricity. Use M 20 and Fe 415 grades of concrete and steel.

4. a) **Attempt any <u>THREE</u> of the following:** **12**

(i) Write any four advantages of prestressed concrete.

(ii) Define limit states and state types of various limit states.

(iii) State two situations where doubly reinforced section is preferred.

(iv) Calculate working load carrying capacity of column 230 × 230 mm. Provided with 4 bars of 16 mm diameter. Use M 20 concrete and Fe 415 steel.

b) **Attempt any <u>ONE</u> of the following:** **6**

(i) A doubly reinforced beam 300 mm × 500 mm effective is reinforced with 1035 mm^2 at 25 mm below top edge and 1840 mm^2 above bottom edge. Take M 20 concrete and steel Fe 415. Find moment of resistance (Mu). Use - fsc = 355 N/mm^2 and neglect σcc.

(ii) A beam 250 mm × 600 mm effective is subjected to a factored moment of 300 kN/m. Assume d^1 = 30 mm and M 15 and Fe 415, find area of compression steel and tension fsc = 355 N/mm^2 and neglect σcc.

Marks

5. Attempt any TWO of the following: **16**

a) Determine the ultimate moment capacity of a beam b = 280, d = 500 mm d^1 = 50, Asf = 2450 mm^2, Asc = 400 mm^2, fck = 30 N/mm^2, fy = 415, fsc = 355N/mm^2 and neglect σcc.

b) Design the shear reinforcement for a beam of 8 m span having 30 kN/m udl, beam size 300 mm × 610 mm, overall 30 mm cover. The reinforcement consist of 6 bars of 25 mm diameter concrete is M 20 grade and steel of Fe 415 grade.

Use table 1:

P	1.0	1.25	1.5	1.75	2.0
τc	0.60	0.64	0.68	0.71	0.71

c) Design a RC column footing with following data size of column. 400 × 400 mm, safe bearing capacity of soil = 200 kN/m^2 load on column is 1200 kN. Use M 20 and Fe 415 steel. Check for punching shear and one way shear need not be given.

6. Attempt any FOUR of the following: **16**

a) Draw stress and strain diagram for doubly reinforced section in L.S.M. State meaning of each term shown in diagram.

b) Calculate effective flange width for a T-beam for following details:

c/c distance between supports = 8 m

slab thickness = 120 mm

c/c distance between beams = 4.2 m

width of rib = 300 mm

effective depth = 580 mm

width of support = 400 mm

c) State the I.S. specification for pitch and diameter of lateral ties.

d) State I.S. specification for longitudinal reinforcement, cover and eccentricity in axially loaded columns.

e) Explain in detail the concept of under reinforced, over reinforced and balanced section. Draw related diagram.