17604

11920

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.

Marks

1. (a) Solve any THREE : **12**

(i) Define 'partial safety factor' and state it's value for steel and concrete.

(ii) Write any four assumption is design for limit state of collapse in flexure.

(iii) State any four ductile detailing provision as per IS 13920.

(iv) State advantages (any two) & disadvantages (any two) of pre-stressed concrete.

(v) State the values for maximum spacing of bars in slabs & minimum shear reinforcement for beams.

(b) Attempt any ONE : **06**

(i) An RCC beam 230 mm wide & 400 mm deep effective is supported over an effective span of 5.5 m. It is reinforced with 4-20 mm dia. bar along tension side only. Calculate the ultimate moment of resistance & working load if m 20 concrete & Fe 415 steel is used.

(ii) Draw stress – strain diagram for singly reinforced beam in LSM. State the values of position of N.A., moment of resistance & percentage steel for balanced section. For all grades of steel i.e. Fe 250, Fe 415 & Fe 500.

2. Attempt any TWO : **16**

(a) Design a slab for a hall 9 × 3.5 m for following data – live load = 2 kN/m^2, floor finish = 1 kN/m^2, width of support = 230 mm, M.F. = 1.5. Use M15 concrete & mild steel. Draw sketch of reinforcement details. Check for shear & development length need not to be taken.

(b) Design a slab for a hall size of 4 m × 5.5 m using M 20 concrete & Fe 415 steel. Take live load = 2 kN/m^2 floor finish = 0.5 kN/m^2, MF = 1.4, $\alpha n = 0.114$, $\alpha y = 0.035$, check for shear & deflection need not to be taken. Draw reinforcement sketch.

(c) Design a cantilever chajja for a span of 2 m carrying LL = 2.5 kN/m^2 & FF = 0.5 kN/m^2. Use M20 concrete & Fe 415 steel. Take MF = 1.6. Check for shear & deflection & development length need not to be taken. Draw reinforcement detail sketch.

3. Attempt any FOUR : **16**

(a) State the IS specifications for effective flange width of T & L beam with meaning of terms used in it.

(b) Calculate effective flange width for a T beam having c/c distance between supports = 8.4, c/c distance between beam = 4m, slab thickness = 150 mm, width of rib = 350 mm, support thickness = 400 mm.

(c) Find development length of 16 mm dia. bar in tension & compression. Use M20 concrete & Fe 500 grade steel. Take $\tau bd = 1.2$ N/mm^2.

(d) State any four uses of bent up bar in shear reinforcement.

(e) Design a circular column to carry an axial load of 1500 kN. Use M20 concrete & Fe 415 steel. The unsupported length of column is 3.5 m. Use 1% steel for main bars. Assume both ends of column are hinged.

4. (a) Attempt any THREE : **12**

(i) State any four types of losses in prestressed concrete with their percentage.

(ii) State any four functions of reinforcement.

(iii) State any four conditions where doubly reinforced beam is provided.

(iv) Calculate working load carrying capacity of column 300 × 300 mm provided with 4 – 20 mm ϕ bars. M 20 concrete & Fe 415 steel is used.

(b) Attempt any ONE : **06**

(i) Find ultimate moment of resistance of a beam 230 × 460 mm deep to the centre of tension reinforcement. It is provided with 2 – 16 mm ϕ bars at top & 4 – 20 mm ϕ bars at bottom. Take effective cover on both side = 40 mm, f_{sc} = 217 N/mm^2. Use M 15 concrete & M.S. Grade – I steel. Neglect f_{cc}.

(ii) Design a doubly reinforced beam 250 × 600 mm overall for a factored moment of 300 kNM at a particular section. Find area of steel required for beam. Assume d' = 50 mm, M 20 concrete & Fe 415 steel.

d'/d	0.05	0.10	0.15	0.20
fsc (N/mm^2)	355	352	342	329

5. Attempt any TWO : **16**

(a) Determine the ultimate moment resisting capacity of a beam. Take b = 250 mm, d = 450 mm, d' = 30 mm, Ast = 2450 mm^2, ASC = 400 mm^2, f_{ck} = 20 N/mm^2, f_y = 415 N/mm^2, f_{sc} = 355 N/mm^2 & neglect fcc.

(b) A singly reinforced beam 230 × 450 mm deep (effective) is reinforced with 3 – 20 mm dia of Fe 415 bars to resist a factored shear force of 150 kN. Design 8 mm ϕ two – legged vertical stirrups. Take $\tau_{c_{max}}$ = 2.8 MPa. Use following table for τ_c.

% pt	0.50	0.75	1.00
τ_c in N/mm^2	0.48	0.56	0.62

P.T.O.

(c) Design a RC column footing for a column of size 400 × 400 mm. Take SBC of soil = 200 kN/m^2 & load on column is 1500 kN. Use M20 concrete & Fe 415 steel. Calculate depth of footing using bending moment criteria only.

6. Attempt any FOUR : **16**

(a) State IS specifications for longitudinal & transverse steel for column.

(b) State effective length for any four end conditions of column with neat sketch.

(c) Explain – 'over reinforced sections are not permitted as per IS codes'.

(d) Define Nominal Cover. Why cover is provided ?

(e) For a T-beam with following dimensions :

Width of flange = 1500 mm

Width of web = 300 mm

Effective depth = 500 mm

Depth of slab = 120 mm

Tension steel = Ast = 2000 mm^2

Materials = M 20 – Fe 415

Calculate ultimate moment of resistance of the section.
