17604

15116

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

Instructions – (1) All Questions are *Compulsory.*

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

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Preferably, write the answers in sequential order.

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

Marks

1. a) Attempt any THREE of the following : **12**

(i) List the various limit states and define any one of it.

(ii) Define magnitude of earthquake and intensity of earthquake.

(iii) State any four assumptions made in the theory of bending of singly reinforced section.

(iv) List four losses in prestressing and explain any one of them.

(v) Why the contribution of bend up bar is restricted to 50% in shear resistance ?

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

(i) A RC section 250 mm × 450 mm effective is reinforced with 4 No - 16 mm dia bars of Fe 415 on tension side only. If M20 concrete is used, calculate ultimate moment of resistance the beam can offer.

Marks

(ii) Calculate ultimate moment of resistance and steel required for a beam 230 mm × 400 mm effective, if M25 concrete and Fe 500 steel are used.

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

a) Design a simply supported RCC slab over a passage of effective span 3.2 m by using M25 concrete and Fe 415 steel. Assume super imposed load including floor finish as 3 kN/m^2 and M.F. = 1.4. Sketch the c/s.

b) Design a simply supported slab panel of effective plan dimensions of 4.0 m × 6.0 m. The slab is subjected to a live load of 3.5 kN/m^2 and floor finish as 1.0 kN/m^2. Use M25 concrete and Fe 500 steel. Assume M.F. = 1.6 and corners are free to lift up. Take α_x = 0.104 and α_y = 0.046. Sketch the structural details. (Checks not required)

c) Design a cantilever slab of effective span 2.0 m using M20 concrete and Fe 415 steel if it is subjected to superimposed load of 2.5 kN/m^2 including finishing. Take M.F. = 1.8. Draw the section, giving all details.

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

a) Calculate effective flange width for a T beam if clear span of beam is 6.20 m, width of supports = 300 mm each, spacing of beams 3.0 m dc, width of web = 250 mm and slab thickness = 120 mm.

b) Write the provision of IS code for beam spanning parallel to slab to act as T beam with sketch.

c) When minimum shear reinforcement is provided give it's expression with meaning of each term used.

d) Determine the development length of 16 mm diameter Fe 415 bar in compression if design bond stress is 1.4 MPa for plain bar in tension.

e) Calculate safe load carrying capacity of a short column 400 mm × 400 mm, reinforced with 8 No. 16 mm diameter bars, if M20 concrete and Fe 500 steel is used.

Marks

4. a) Attempt any THREE of the following : **12**

(i) Explain the basic principle of prestressing with diagram for a beam in flexure.

(ii) State any four functions of lateral ties in the column.

(iii) Explain the terms 'balanced', 'over reinforced' and 'under reinforced' sections in bending and state which is generally preferred in practice.

(iv) Define doubly reinforced section and state two situations in which it is necessary.

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

(i) Calculate ultimate moment of resistance of doubly reinforced rectangular section 250 mm × 450 mm effective, if Ast = 1250 mm^2, Asc = 240 mm^2, dc = 40 mm, Assume M20 concrete and Fe 250 steel. Use σ_{cc} = 8.92 N/mm^2 and σ_{sc} = 217.5 N/mm^2.

(ii) Design RC rectangular beam of M25 concrete and Fe 415 steel, having b = 300 mm, d = 500 mm, subjected to ultimate bending moment of 350 kNm. Assume dc = 50 mm, fsc = 353 MPa.

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

a) Design a doubly reinforced rectangular beam for an effective span of 6.0 m to carry an udl of 40 kN/m including self weight. The beam section is restricted to 300 mm × 600 mm overall. Use M20 concrete and Fe 415 steel. Assume effective covers as 50 mm. Use σ_{sc} = 354 N/mm^2.

b) Design shear reinforcement in the form of 2 legged 10 mm diameter vertical stirrups for a beam section 300 mm × 600 mm effective subjected to ultimate shear force of 300 kN. Assume M25 concrete, Fe 415 steel, τ_{cmax} = 3.1 MPa and τ_c = 0.65 MPa.

c) Calculate the size, depth and Ast required for a square footing supporting a column 400 mm × 400 mm carrying an axial working load of 1200 kN. Use M25 concrete and Fe 415 steel. Assume SBC of soil as 350 kN/m^2. Do not check the design for shear.

Marks

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

a) Calculate ultimate moment of resistance of a T beam having flange width 1100 mm, depth of slab 120 mm, effective depth of beam 500 mm, width of web 250 mm. It is reinforced with 4 No 20 mm diameter bars of Fe 415 steel. Assume M25 concrete.

b) Why over reinforced sections are not allowed in LSM of design ?

c) Write the expressions for effective width of flange for T and L beams with meaning of each term.

d) Write the four commonly used support conditions for the columns and their effective lengths. Also sketch the elastic curves.

e) Sketch the critical sections used in the design of pad footings for bending and shears.

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