17604

11819
4 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*
(2) Figures to the right indicate full marks.
(3) Assume suitable data, if necessary.
(4) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

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

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

(b) State the functions of reinforcement.

(c) State the reasons for providing shear reinforcement in the form of stirrups.

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

(e) Explain the prestressed concrete. Also state the difference between externally and internally prestressed concrete members.

(B) Attempt any ONE : **1 × 6 = 6**

(a) Find limiting moment of resistance and steel required for a beam 300 × 600 mm (effective), if concrete M25 and Fe415 steel are used.

(b) Calculate A_{st} required for R.C.C. section 200 × 450 effective to resist an ultimate bending moment of 150 kNm. Assume M30 concrete of Fe415 steel.

2. Attempt any TWO of the following : **2 × 8 = 16**

(a) Design a cantilever slab of 2m span carrying superimposed load of 3 kN/m^2 including floor finish. Adopt M20 and Fe415 steel. Sketch the C/S of slab showing all details. (No check required). Take end bearing is 230 mm.

(b) Design a roof slab for a room having inner dimensions as 3.0 × 4.5 m. The slab is simply supported on four sides of walls of 230 mm thick and corners are not held down. The live load is 2 kN/m^2. Use M20 concrete and Fe415 steel. Take M. F of 1.4. Sketch the cross section of slab along shorter span showing all details. (No check required)

$\frac{ly}{lx}$ = a	1.4	1.5
αx	0.099	0.104
αy	0.051	0.046

(c) The passage 3m wide is supported on 230 mm thick side walls. It carries superimposed loads of 4 kN/sq. m including floor finish. Design a one way slab using M20 concrete and Fe415 steel. Take M.F. = 1.4. Sketch C/S of slab along shorter span showing reinforcement details (check not required).

3. Attempt any FOUR of the following : **4 × 4 = 16**

(a) Calculate safe load carrying capacity of short R.C.C. column 300 × 300 mm consisting of 4 bars of 16 mm ϕ and 2 bars of 12 mm ϕ. Use M20 concrete and Fe250 steel.

(b) Write entire procedure step by step for providing shear reinforcement in an R.C.C. beam according to limit state method.

(c) Determine the development length of 16 mm diameter Fe415 bar in compression, if design bond stress is 1.4 MPa for plain bar in tension.

(d) Write provision of flange width of T beam as per I.S., State meaning of each term.

(e) Find moment of resistance (Mu) of a T beam with following data b_f = 1500 mm, b_w = 300 mm; d = 700 mm; D_f = 100 mm, A_{st} = 2500 mm^2. Concrete M20 and Fe415 steel.

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

(a) Describe process of prestressing and draw stress distribution diagram for it across a section.

(b) Justify over reinforced sections are disallowed in L.S.M.

(c) Draw stress and strain diagrams for doubly reinforced section in LSM. State meaning of each term.

(d) Design a circular column to carry an axial load of 1500 kN. using Ms. Lateral ties. Use M25 concrete and Fe415 steel. The unsupported length of column is 3.75 m.

(B) Attempt any ONE of the following : **1 × 6 = 6**

(a) Find the moment of resistance of the beam 250 × 500 mm deep if it is reinforced with 4-20 mm diameter bars in tension zone and 2-12 mm diameter bars in compression zone, each at an effective cover of 40 mm. Assume M15 concrete and Fe415 steel.

(b) A beam is required to resist a total B.M. of 120 kNm. The size of beam is limited to 300 mm × 610 mm overall. Clear cover on both sides is 30 mm. Calculate reinforcement in form of 20 mm diameter on both sides. Use (M15 and Fe415)

5. Attempt any TWO : **2 × 8 = 16**

(a) Design a rectangular beam for an effective span of 5.85 m. The superimposed load is 70 kN/m and size of beam is limited to 300 × 700 mm overall. Use M20 and Fe415. Assume a cover of 40 mm.

P.T.O.

(b) Design a shear reinforcement for a beam of 6 m span having 25 kN/m Udl beam size 300 mm × 600 mm overall 30 mm cover. The reinforcement consists of 6 bars of 25 mm diameter. Concrete is M20 grade and steel of 415 grade.

Pt (%)	1.0	1.25	1.5	1.75	2.0
T_c	0.6	0.64	0.68	0.71	0.71

(c) A square column size 400 × 400 mm carries axial load of 1000 kN. Determine size of square footing for column. If the SBC of soil is 200 kN/m^2. Calculate depth of footing for B.M. criteria. Use M25 and Fe415 steel.

6. Attempt any FOUR of the following : 4 × 4 = 16

(a) Write four IS specifications for the longitudinal reinforcement in columns.

(b) State the meaning of nominal cover. State purpose of providing cover to reinforcement.

(c) Calculate effective flange width for a T beam having span 8 m. The C/C distance between beams is 2.5 mm, width of web as 230 mm and flange depth as 120 mm supports are simple.

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

(e) Calculate ultimate moment of resistance of the T beam having flange width 800 mm, slab thickness 120 mm, web thickness 300 mm and effective depth 500 mm to the centre of 4-20 mm Fe415 bars using M25 concrete (singly reinforced section is sufficient)

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