

316308

25226

4 Hours / 70 Marks

Seat No.

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- 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. Attempt any FIVE of the following : 10
- a) Define partial safety factor and write its values for load and material.
 - b) Define the terms : Characteristic strength and design load.
 - c) Write expression for minimum and maximum Reinforcement in Beam.
 - d) Define development length and state its significance.
 - e) Define Aspect Ratio in case of slab and state its importance.
 - f) State any four functions of lateral ties in the column.
 - g) Define bolt value. Explain meaning of grade 4.6 bolt.

P.T.O.

- 2. Attempt any THREE of the following : 12**
- a) State any four types of structural steel sections along with sketches.
 - b) Explain advantages and disadvantage of steel as construction material.
 - c) Define fillet weld and draw a neat sketch showing its details.
 - d) Explain the types of failure in bolted connections along with neat sketches.
- 3. Attempt any THREE of the following : 12**
- a) Explain the assumptions made in the design for the limit state of collapse in flexure.
 - b) Draw stress-strain diagram for singly reinforced section.
 - c) State the equation used for minimum shear reinforcement giving meaning of term used in it.
 - d) A Reinforced Beam having section $250\text{ mm} \times 450\text{ mm}$. effective is Reinforced with 4 Bars of 16mm Diameter having grade Fe450 on tension side. If M20 concrete is used, calculate ultimate moment of Resistance the Beam can offer.
- 4. Attempt any THREE of the following : 12**
- a) Explain the IS specification of minimum eccentricity and Transverse Reinforcement in column.
 - b) Design a square column to carry an axial load of 2500kN. The unsupported length of the column is 4.5m. Use M20 concrete and Fe500 steel for Longitudinal Reinforcement. Use MS bars for lateral Ties. Apply the check for minimum eccentricity.
 - c) Design a Rectangular column to carry an axial load of 1500kN using M.S. lateral ties. Use M25 concrete and Fe415 steel. The unsupported length of column is 3.75m.

- d) Determine bolt value of 16mm diameter bolt of 4.6 grade to connect two angles of $90 \times 60 \times 6$ mm back to back opposite side of gusset plate of 8mm thickness. Also determine number of bolts required if it carries a direct factored load of 110kN.
- e) Design a suitable fillet weld of size 4mm to connect a tie bar 80×8 mm to 10mm thick gusset plate. Joint has to be designed for full strength of the tie bar and welding on all three sides. Take $f_y = 250$ MPa, $\gamma_{mo} = 1.1$, $f_u = 410$ MPa and $\gamma_{mw} = 1.5$. Draw a neat sketch showing tap length.

5. Attempt any TWO of the following :

12

- a) Design a singly Reinforced beam having width 230mm and span 4m. It carries a working udl of 5kN/m throughout the span. Use M20 concrete and Fe415 steel.
- b) A simply supported beam of span 5m carries a working Udl of intensity 40kN/m. size of the beam is 350mm $\times$ 500mm (effective). It is reinforced with 4 bars of 20mm diameter. Design 8mm diameter 2 - legged vertical stirrups.
Take $\tau_c = 0.5$ N/mm², $\tau_{cmax} = 2.8$ N/mm² use M-20 grade concrete and Fe415 grade steel.
- c) Design a R.C.C. column square footing for a column size 400mm $\times$ 400mm. Load on column is 1200kN. Take SBC of soil = 200kN/m². Use M20 concrete and Fe415 steel. Draw the cross section of footing showing Reinforcement details (No check required)

6. Attempt any TWO of the following :**12**

- a) Design a simply supported one way slab for an effective span of 3.3m to carry superimposed load of 4 kN/m^2 including floor finish. Take M.F = 1.2. Use M20 grade of concrete and Fe415 steel. Draw the C/S of slab showing Reinforcement details (No check required)
 - b) Design a suitable slab for a internal Room having size $4 \times 7\text{ m}$. Take live load of 2 kN/m^2 and floor finish of 1 kN/m^2 . Assume width of support = 230mm. Take M.F = 1.4, $\alpha_x = 0.100$ $\alpha_y = 0.056$. Use M20 concrete and Fe415 steel. Do not apply check for shear and Bond. Sketch the cross-section along shorter span.
 - c) Design a cantilever chajja with following data span = 1.50m, width = 2m, L.L = 1.5 kN/m^2 . Floor finish = 0.5 kN/m^2 , support lintel = $230 \times 300\text{ mm}$. Concrete M20, Fe415 steel. Sketch the c/s of chajja. Showing steel details.
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