22502

12425

04 Hours / 70 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. Attempt any FIVE of the following: **10**

a) State any four advantages of steel as a construction material.

b) Write the Function of Steel towers and Roof trusses. (any two of each)

c) Define pitch and Gauge distance in bolted connections.

d) Define the terms-characteristic strength and design load.

e) Give expression for development length along with the notations used in it.

f) Define aspect ratio in case of slab and state its importance.

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

Marks

2. Attempt any THREE of the following: **12**

a) State any four types of load to be considered while designing a steel structure. Also state respective I.S. Codes.

b) State any four assumptions made in the design for the limit state of collapse in flexure.

c) When minimum shear reinforcement is provided? State the equation used for minimum shear reinforcement giving meaning of terms used in it.

d) Calculate development length for a 20 mm diameter bar in tension and compression. Assume M20 grade concrete and Fe 500 grade steel. use τbd = 1.2 N/mm^2.

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

a) Design the Lap joint between two plates of sizes 100 mm × 12 mm thick each, to transmit a factored load of 80 KN using single row of bolts of grade 4.6 and 410 grade of plate.

b) Design suitable fillet weld of size 6 mm to connect an ISA 80 × 50 × 8 mm with its longer leg connected to gusset plate of thickness 8 mm. The angle is subjected to factored load of 300 KN. Assume weld applied to all three edges and shop weld. Take C_{XX} = 27.3 mm.

c) i) Differentiate between under reinforced and over reinforced section with reference to area of steel, depth of neutral axis and moment of resistance.

ii) State the meaning of Nominal Cover. State the purpose of providing cover to reinforcement. (any two).

Marks

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

a) Design a rectangular R.C. beam section to carry a working bending moment of 70 KN-m. Assume b = ½d. Use M20 grade concrete and Fe 415 steel (checks are not expected).

b) Find moment of resistance of R.C.C. beam 230mm wide and 550mm deep effective, reinforced with 4 bars of 22mm diameter on tension side. Use M20 grade concrete and Fe 415 steel.

c) A simply supported beam of span 5m carries a working UdL of intensity 40KN/m. size of the beam is 350mm × 500mm (effective). It is reinforced with 4 bars of 20mm diameter. Design 8mm diameter 2 legged vertical stirrups if one 20mm diameter bar is bent up. Take $\tau c = 0.5N/mm^2$, $\tau cMax = 2.8N/mm^2$ use M20 grade concrete and Fe415 grade steel.

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

a) Design a simply supported slab for an effective span of 3.3m to carry superimposed load of $4KN/m^2$ 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 checks required).

b) Design a cantilever ... chajja with following data. Span = 1.50m, width = 2.0m. Live load = $1.5KN/m^2$, Floor finish = $0.5KN/m^2$, support lintel = 230mm × 300mm. Use M20 grade concrete and Fe415 steel. Sketch the c/s of Chajja showing reinforcement details (No checks)

c) Design a simply supported slab pannel of effective plan dimensions of 4.0m × 6.0m. The slab is subjected to live load of $3.5KN/m^2$ and floor finish as $1.0KN/m^2$. Use M25 grade of concrete and Fe500 steel. Assume M.F = 1.6 take $\alpha x = 0.104$ and $\alpha y = 0.046$. Sketch the c/s of slab showing all details (No checks)

Marks

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

a) Design an axially loaded RCC square column to carry a factored load of 2500KN. The column is effectively held in position at both ends but not restrained against rotation. The unsupported length of column is 3.20m. Use M25 grade concrete and Fe415 grade steel.

b) Design RC column footing foran axially loaded square column 400mm × 400mm. It carries a factored load of 1600KN safe bearing capacity of soil is 200KN/m^2. Calculate the depth of footing for bending moment criteria only. (No shear check is required) Use M20 grade concrete and Fe415 steel.

c) State the I.S 456-2000 specifications for

i) Minimum Eccentricity of an axially loaded short column.

ii) Diameter and pitch of transverse steel in column.