22502

11920

4 Hours / 70 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) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) 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) Enlist the components and corresponding functions of steel water tank.

b) Define bolt value and pitch.

c) State the values of partial safety factors for material strength of concrete and steel for limit state of collapse.

d) Write the expression for minimum shear reinforcement giving the meaning of terms involved.

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

f) Write any two IS specifications for longitudinal reinforcement of an axially loaded short column.

g) Enlist two load to be considered as per IS 875-1987 while designing steel structures.

Marks

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

a) Explain the limit state of serviceability applicable to steel structures.

b) In steel constructions bolts of grade 4.6 are generally used. What do you mean by grade 4.6?

c) Define over reinforced sections and state two reasons due to which they are avoided.

d) Diameter of steel bar is 20 mm. Use Fe415 steel and design bond stress is 1.2 MPa. For plain bars in tension. Find development length in tension and compression.

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

a) Design the lap joint for plates 100 × 10 mm and 80 × 10 mm thick connected, to transmit 120 kN factored load using single raw of 18 mm dia. bolts of 4.6 grade and plates of 415 grades.

b) Design a suitable fillet welded connection for 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 270 kN. Cxx = 27.5 mm. Assume weld applied to all three edges and shop weld. Take fy = 250 MPa and fu = 410 MPa.

c) 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

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

a) Calculate depth and area of steel at mid span of a simply supported beam over a clear span 6 m. The beam is carrying all inclusive load 20 kN/m. Assume 300 mm bearings. Use M20 and Fe500. Assume (b = ½ d)

b) A simply supported beam of span 5 m carries a working udl of intensity 40 kN/m. Size of beam 350 mm × 500 mm (effective). It is reinforced with 4 bars 20 mm diameter. Design 8 mm diameter 2 legged stirrups if one 20 mm diameter bar is bent up. Take τ_c = 0.5 N/mm^2, $\tau_{c\ max}$ = 2.8 N/mm^2. Use M20 grade concrete and Fe415 steel.

c) State the various forms of shear reinforcement. State formula for the same.

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

a) Design a one way slab with the following data, span = 3 m, live load = 4 kN/m^2 floor finish = 1 kN/m^2. Concrete M20 and Fe415 steel. Take M.F. as 1.4. (No check required).

b) Design a reinforced concrete slab panel for 6.3 × 4.5 m simply supported on all the four sides. It has to carry a live load of 4 kN/m^2 in addition to its dead load. Use M25 concrete Fe 415 steel. (No checks) Use α_x = 0.062 & α_y = 0.060.

c) Design a cantilever chajja with following data : Span = 1.50 m, width = 2.0 m, L.L. = 1.5 kN/m^2. Floor finish = 0.5 kN/m^2, support lintel = 230 × 300 mm concrete M20, Fe 415 steel, sketch the c/s of chajja. Showing steel details.

Marks

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

a) Design a square column to carry an axial load of 1500 kN. The unsupported length of the column is 3.5 m. Use M20 concrete & 1% Fe500 steel for longitudinal reinforcement. Use MS bar for lateral ties. Apply the check for minimum eccentricity.

b) 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.

c) Design on R.C. column footing with following data.
Size of column = 400 mm × 400 mm.
Safe bearing capacity of soil = 200 kN/m^2.
Load on column = 1400 kN.
Concrete M20 and steel Fe 415 is used.
Calculate depth of footing from B.M. Criteria.
No shear check is required.