22502

23242

4 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 two advantages of steel as a construction material.

b) Which IS code is used for design of

   i)   Steel Structure

   ii)   R.C.C.

c) Define:

   i)   Pitch

   ii)   End Distance

d) What is the partial safety factor for steel and concrete as per IS 456-2000 for limit state of collapse.

e) Write the formula for development of steel as per IS456

    f)   Write any two differences between one way and two way slab.

    g)   Define:

        i)   Effective length of column

        ii)   Slenderness Ratio

2.   **Attempt any <u>THREE</u> of the following:**   **12**

    a)   Write full form for

        i)   ISJB

        ii)   ISA

        iii)   ISMC

        iv)   ISNT

    b)   Define over reinforced section and state any two reason due to which they are avoided in actual practice.

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

    d)   Calculate the development length for steel bar in tension and compression if diameter of bar is 16 mm use Fe-415 and bond stress is 1.2 MPa.

3.   **Attempt any <u>TWO</u> of the following:**   **12**

    a)   Calculate the bolt strength of 20 mm dia bolt of grade 4.6 for single cover butt joint. The thickness of cover plate is 10 mm and thickness of main plate is 12 mm. As per shown in the **Fig. No. 1.**
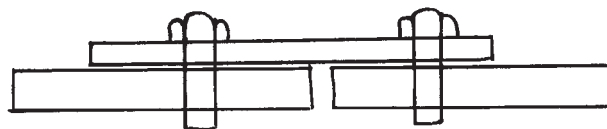
<u>Fig. No. 1</u>

    b)   Design the fillet weld to connect the ISA (90 × 90 × 8) mm to a gusset plate 8 mm thick. The angle is subjected to factored load of 250 KN. Cxx = 25.1 mm. Assume the weld on two edges and shop weld. Fy = 250 MPa Fu = 410 Mpa.

c) i) Draw a neat and labelled sketch of stress block diagram for singly reinforced beam section showing important parameters on it.

ii) Write any three assumption for limit state of collapse in flexure.

4. Attempt any <u>TWO</u> of the following: 12

a) Find the limiting moment of resistance and steel required for beam 300 × 550 mm effective. Use M-20 grade of concrete and Fe-415 steel.

b) Design a singly reinforced beam having width 230 mm and span 4 m. It carries a working udl of 5KN/m throughout the span. Use M20 grade of concrete and Fe-415 steel.

c) A simply supported beam of span 5 m carries a design load of intensity 40KN/m. size of beam is 350 mm × 500 mm (effective). It is reinforced with 4 bars of 20 mm diameter.
Design 8 mm – 2 L stirrups. Take τ_c = 0.5 N/mm².
$\tau_{c\ max}$ = 2.8 MPa. M20 grade of concrete Fe-415 steel.

5. Attempt any <u>TWO</u> of the following: 12

a) Design a one way slab with the following data. span - 4m. Live load 4KN/m². Floor finish 1KN/m² use M-20 concrete grade, Fe-415 steel. Take M.F. = 1.4 (No check required)

b) Calculate the reinforcement required and design a R.C.C. slab panel of 6.3 m × 4.5 m simply supported on all four sides. It carries a live load of 4 KN/m² and floor finish of 1KN/M². Use M20 grade of concrete and Fe-500 steel. Sketch the cross section of slab along longer direction. MF = 1.4. Bending co-efficient are αx = 0.085 αy = 0.056 (No check)

c) Design a chajja for a span of 0.75 m. Take L.L = 2KN/m², F.F = 0.5 KN/m². Use M-20 grade of concrete and Fe-415 steel. Size of lintel supporting the chajja is (230 × 230)mm. Do not apply check for shear and bond. Sketch the c/s of chajja.

Marks

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

a) Design a square column to carry an axial load of 1000 KN using mild steel lateral ties. Use M25 grade of concrete and Fe-415 steel. Take unsupported length of column is 3.0 m. Use 1% of steel and apply the check for minimum eccentricity and for short column.

b) Design a circular column to carry an axial load of 1500 KN using MS lateral ties. Use M25 and Fe 415 Steel. The unsupported length of column is 3.75 m. Check for minimum eccentricity.

c) Design a R.C.C. column square footing for a column size of 400 mm × 400 mm. Load on column is 1200 KN. Take SBC of Soil = 200 KN/M^2. Use M20 grade of concrete and Fe = 415 steel. Draw the cross section of footing showing reinforcement details (No check required)

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