T.E. / Civil / Sem-I / 'C' Scheme / Subj- TRCS / Date:- 12/11/2025
S.H. 2025
QP. Code:- 100950 72

(Time: 3 hour) **Maximum Marks - 80**

Note Question **No. 01 is compulsory**, attempt any **three** out of the remaining five questions

Use of IS 456:2000 is permitted

Assume suitable data if required and state it clearly

Q.1 **Attempt ANY FOUR from following**

a) Write down the permissible stresses for M20, M25 and M30 grade concrete and Fe250 and Fe415 steel grade **05**

b) What type of slabs are usually used in practice, under-reinforced or over-reinforced? Give reason **05**

c) Calculate Reinforcement in the Central band for the Total Area of Reinforcement 2500 mm^2. Size of the Footing is 4m x 2.5m. **05**

d) A Square column 450 mm x 450 mm is reinforced with 4 no. of bars 16mm diameters using M20 grade concrete and Fe415 steel. Find the Load carrying capacity of the column if it is a axially loaded short column. **05**

d) Explain characteristic strength of Materials, Characteristic Load and partial safety factors. **05**

e) What do you mean by side face reinforcement? When it is provided in the beam. Draw reinforcement detailing showing side face reinforcement. Assume suitable data. **05**

f) How will you check whether a beam of given dimension has to be designed as a doubly reinforced beam? **05**

Q.2 a) A RC section of size 230 X 600 mm is provided with 3 bars of 16 mm diameters with effective cover of 40 mm. What super imposed uniformly distributed load the beam can carry over a simply supported span of 5 m? The materials to be used are, M25 concrete and Fe415 steel. Use working stress method. **10**

b) Find the factored moment of resistance of a beam section 230 mm wide X 460 mm effective depth reinforced with 2-16 mm diameter bars as compression reinforcement at an effective cover of 40 mm and 4-20 mm diameter bars as tension reinforcement. The materials are M20 grade concrete and mild steel reinforcement. Use Limit state method. (Take fsc = 217 N/mm^2) **10**

Q.3 a) Determine the position of the neutral axis of a reinforced concrete beam 250 mm wide x 360 mm effective depth. If the stresses developed in concrete and steel are 6.5 N/mm^2 and 174 N/mm^2 respectively. The materials are M20 grade concrete and Fe 415 steel. Also determine the type of beam. Adopt working Stress Method. **07**

b) A T Beam of effective flange width 1100 mm, thickness of the slab is 110 mm, width of the rib is 230 mm and effective depth is 560 mm. The T beam is reinforced with 3 no. of bars 25 mm diameters at the bottom of the beam. Calculate the factored moment of resistance. The Materials are M25 concrete and Fe415 steel. Adopt LSM. **08**

c) Calculate Minimum Reinforcement as per IS 456:2000 for the following details. **5**

1) Tension Reinforcement in Beam, b= 230 mm, d= 460 mm, D = 500 mm, Fe415 steel.
2) Slab of Overall Depth = 150 mm, Fe 415 steel.
3) Column of size, 450 mm x 450 mm

Q.4 a) Design a shear reinforcement for a beam of 230 mm x 450 mm effective depth carrying a factored shear force of 230 kN. It is reinforced with 4 no of bars of 16 mm diameter. Use M20 grade concrete and Fe415 steel. Adopt Limit State Method. **10**

b) Design a one way slab of spans 3.6 m, if live load is 3 kN/m^2 and finishing load is 1 kN/m^2. Assume width of beams as 250 mm. Use M20 concrete and Fe415 steel. **10**

Q.5 a) Design the reinforcement for a short axially loaded square column of size 400 x 400 mm to support a load of 1000 kN. Use M20 grade concrete and Fe415 steel. **10**

b) Write down with neat sketch, where exactly you find the critical section in the design of isolated footing for Bending moment, one way shear and Two way shear. **05**

c) Expalin Limit state of collapse and Limit state of serviciability. **05**

Q.6 a) Design a square footing for a short axially loaded column of size 300 x 300 mm carrying 600 kN. Use M20 grade concrete and Fe415 steel. SBCC of soil is 180 kN/m^2. Sketch the details of reinforcement. **12**

b) Write down the steps to design circular column with helical reinforcement. Also write different formulas that are used in the design. Assume suitable data to draw reinforcement detailing of the Circular column with helical reinforcement. **08**
