Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech, IDD (B.Tech and M.Tech)**
Sub_Code: RCI5C001

5th Semester Regular/Back Examination: 2024-25
SUBJECT: Design of Concrete Structures
BRANCH(S): C&EE, CIVIL
Time: 3 Hours
Max Marks: 100
Q.Code: R227

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.
(Use of relevant IS Codes is allowed)

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Calculate the tensile strength and modulus of elasticity of M20 grade concrete.
b) Where doubly reinforced beams are preferred?
c) For a beam of 300 mm wide and 600 mm effective depth, calculate the minimum area of tension steel required. Use Fe 415 steel.
d) What is the role of bent up bars in beams?
e) Determine the equivalent nominal shear for a beam of 250 mm wide and 500 mm effective depth, subjected to an ultimate twisting moment of 120 kNm and ultimate shear force of 80 kN.
f) Why the provision of minimum stirrup reinforcement is mandatory in all reinforced concrete beams?
g) Why steel is used in column?
h) Determine the effective flange width of an L-beam having an effective span of 6 m, rib width of 300 mm and flange thickness 100 mm.
i) Where retaining wall is provided?
j) State different types of water tank.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Explain limit state of collapse and serviceability requirements of structures.
b) Draw the stress-strain curves for reinforcing steels showing the special features.
c) State the behavior of beams with and without shear reinforcements with neat sketch.
d) A rectangular beam section of 300 mm width and 500 mm effective depth is reinforced with 4 bars of 20 mm diameter. Determine the shear reinforcement required to resist 50 kN shear force.

e) A double reinforced beam of size 250 mm x 400 mm overall is provided with tensile reinforcement of 4 bars of 12 mm dia and compressive reinforcement of 3 bars of 12 mm dia. The distance from extreme end upto centre of steel is 40 mm both at top and bottom. Calculate the ultimate moment of resistance of the beam. Use M20 concrete and Fe 415 steel.

f) What is combined footing? What are the situations in which combined footings are preferred to isolated footing?

g) A simply supported beam of clear span 5 m has to carry a superimposed load of 45 kN/m at service. The beam has a bearing of 400 m at each end. Find the reinforcement required. Use M20 and Fe415 steel.

h) Design a circular column to carry a service load of 1600 kN. Use M20 concrete and Fe415 steel.

i) Briefly explain the stability criteria of a retaining wall.

j) What is the purpose of a retaining wall? What are the different types of concrete retaining wall?

k) An open square tank 4.5 m x 4.5 m x 2.5 m deep is supported on brick masonry walls all around. Design the tank. Use M20 concrete and Fe250 steel.

l) Briefly explain the design requirements of elevated type water tanks.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Design a rectangular beam of section 300 mm x 600 mm subjected to an ultimate moment of 160 kNm, ultimate shear force of 60 kN and factored torsional moment of 35 kNm. Use M20 concrete and Fe415 steel. **(16)**

Q4 Design a simply supported RCC floor slab for a room having inside dimensions 4 m x 10 m and supported on all sides by a 400 mm thick wall. The superimposed load may be taken as 3 kN/m^2. Use M20 concrete and Fe415 steel. Assume any other data required suitably as per standard. **(16)**

Q5 Design an isolated column footing for a rectangular column, 400 mm x 600 mm carrying a service load of 1500 kN. Assume the safe bearing capacity of soil as150 kN/m^2. Show the reinforcement detailing. Use M20 concrete and Fe415 steel. **(16)**

Q6 Design a cantilever retaining wall to retain earth embankment 3 m high above ground level. The unit weight of earth is 18 kN/m^2 and its angle of repose is 30^0. The embankment is horizontal at its top. The SBC of soil is 100 kN/m^2 and the coefficient of friction between soil and concrete is 0.5. Use M20 concrete and Fe 415 steel. **(16)**