

B.E./B.TECH. Degree Examination, December 2020

Fifth Semester

CE18502- DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulation 2018)

Time: Three hours

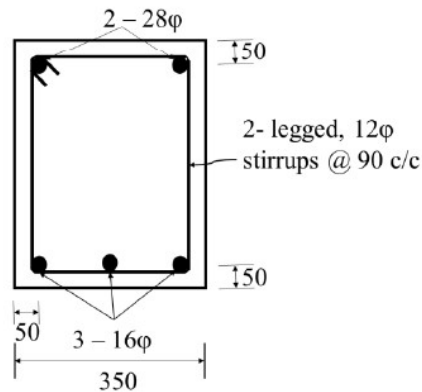
Maximum : 80 Marks

Answer **ALL** questions

IS456:2000, SP16 may be permitted

PART A - (8 X 2 = 16 marks)

1. According to IS 456:2000, which of the following statements about the depth of neutral axis $X_{u,bal}$ for a balanced reinforced concrete section is correct?
 - a) $X_{u,bal}$ depends on concrete grade only
 - b) $X_{u,bal}$ depends on grade of steel only
 - c) $X_{u,bal}$ depends on both grade of steel and grade of concrete.
 - d) $X_{u,bal}$ doesn't depend on the grade of steel and grade of concrete.
2. In the reinforced concrete section shown in the figure(not drawn to scale),the nominal cover provided at the bottom of the beam (subjected to moderate exposure) as per IS 456-2000 ,is



All dimensions are in mm

- a) 30mm b) 36mm c) 42mm d) 50mm
3. As per IS 456-2000 for the design of reinforced concrete beam, the maximum allowable shear stress (τ_{cmax}) depends on the
 - a) grade of concrete and grade of steel b) grade of concrete
 - c) grade of steel d) grade of concrete and percentage of reinforcement.
4. As per IS 456-2000, The minimum number of main steel bars provided in R.C.C. Rectangular column and Circular columns are
 - a) 4 and 6 b) 6 and 4 c) 4 and 8 d) 8 and 4
5. Define modular ratio.
6. Under what circumstances are doubly reinforced beams used?

7. Why is secondary reinforcement provided in one way RC slab?
8. What is the salient condition for minimum eccentricity of column?

PART B - (4 X16 = 64 marks)

09. (a) (i) A RCC beam having size 300mm X 600 mm is subjected to factored (6)
bending moment of 200kNm. Determine the area of steel. Use M25
grade concrete and Fe415 grade steel.
- (ii) Determine the reinforcement required for a doubly reinforced beam (10)
having width 300mm and overall depth 600mm. Given factored
moment 300 kNm. Adopt M25 grade concrete and Fe415 grade steel.

(OR)

- (b) Find the ultimate moment of resistance of a T beam having (16)
 $b_f=740\text{mm}$, $d=480\text{ mm}$, $b_w=250\text{mm}$ $D_f=100\text{mm}$ $A_{st} = 5$ nos of 20mm ϕ bar,
Adopt M25 grade concrete and Fe415 grade steel.
10. (a) A T-beam and slab system is having beams spaced at 3m center to center (16)
with clear span of 5m and supported by 230mm brick walls. The T beam
has the following dimensions: $D_f=100\text{ mm}$, $b_w=250\text{mm}$, $D=600\text{ mm}$, clear
cover is 25mm. The beam has to carry a LL of 4kN/m and is reinforced
with four 20 mm diameter bars as longitudinal tension steel. Design the
shear reinforcement using M25 grade concrete and Fe415 grade steel.

(OR)

- (b) Design a rectangular beam section of 250mm width and 500 mm overall (16)
depth subjected to ultimate values of bending moment of 40 kNm, shear
force of 40kN, Torsional moment of 30kNm. Adopt effective cover of
50mm on top and bottom. Use M20 concrete grade and Fe415 grade steel.
11. (a) Design a floor slab for an interior room, with clear dimensions of (16)
4 m X 10 m. The slab is resting on 230mm thick masonry walls. Assume live
load as 4kN/m² and dead load due to finishes, partition as 1kN/m²

(OR)

- (b) The slab of a residential building of size 4 m X 6m is simply supported on (16)
all the four sides on 230mm walls. Assuming an imposed load of 2kN/m²
and load due to finishes 1kN/m², design the floor slab, use M20 grade of
concrete and Fe415 grade of steel. Adopt mild exposure.

12. (a) Design the reinforcements in a circular column of diameter 300 mm to support a service axial load of 700 kN. The column has an unsupported length of 3m and is braced against side sway. The column is reinforced with helical ties. Adopt M25 grade concrete and Fe415 grade steel **(16)**

(OR)

- (b) A braced reinforced concrete column of circular cross section of 500mm diameter is to support a factored axial load of 2300 kN along with a factored moment of 165 kNm. The unsupported length of the column is 6.3m with effective length of 5.5m. Design the column when it is to be provided with
(i) Lateral ties (ii) Helical reinforcement. Adopt M20 grade concrete and Fe415 grade steel **(16)**