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Question Paper Code: 55103

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

Fifth Semester

Civil Engineering

15UCE503- DESIGN OF REINFORCED CONCRETE ELEMENTS

(IS456-2000 and SP16 Permitted)

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. As per limit state method, Minimum percent of reinforcement in a RC slab in either direction is CO1- R
(a) 0.18 (b) 0.16 (c) 0.14 (d) 0.12
2. A R.C.C. beam not provided with shear reinforcement may develop cracks in its bottom inclined roughly to the horizontal at CO2- R
(a) 25° (b) 35° (c) 45° (d) 55°
3. The minimum diameter of the longitudinal bars in an RCC column should not be less than _____ CO3- R
(a) 12mm (b) 16mm (c) 20mm (d) 25mm
4. _____ footing is used in load bearing masonry construction. CO4- R
(a) Strip (b) Isolated (c) Combined (d) Pile
5. The minimum width of riser and tread for a building is _____ CO5- R
(a) 150mm&250mm (b) 250mm&150mm (c) 350mm & 1.8m (d) 200mm&2m

PART – B (5 x 3= 15Marks)

6. Write the merits of limit state method. CO1- R
7. Define shear and torsional reinforcement. CO2- R
8. Differentiate between short and long column CO3- R

9. State the reason for providing combined footing. CO4- R
10. Enlist the types of staircases CO5- R

PART – C (5 x 16= 80 Marks)

11. (a) A rectangular beam is to be simply supported on supports of 230mm width. The clear span of the beam is 6m. The beam is to have a width of 300mm, the characteristic superimposed load is 12kN/m. Design the beam and sketch the reinforcement details. CO1- App (16)

Or

- (b) Design a slab for an office floor of size 5mX 6m carrying a load of 6 kN/m². The slab is located at the centre (interior panel) and it is supported by a brick masonry wall of 230mm. Use M25 and Fe415. Draw the reinforcement detailing. CO1- App (16)

12. (a) A beam of rectangular section 300mm width and 500mm effective depth, is subjected to factored moment of 180kN-m, factored shear force of 30kN and factored twisting moment of 15kN-m. Determine the area of reinforcement to resist the above forces. Use M20 grade concrete and Fe415 grade steel CO2- App (16)

Or

- (b) A tee beam slab floor of an office comprises of a slab of 150mm thick spanning between ribs spaced at 3m centres. The effective span of the beam is 8m. Live load on floor is 4 kN/m². Use M20 grade of concrete and Fe415 grade of Steel. Design one of the intermediate tee beams. CO2- App (16)

13. (a) Design the reinforcements in the slender column which is restrained against sway using the following data size of Column – 450 X450mm, Effective length about major and minor axis = $l_{ex}=l_{ey}=6m$, unsupported length=7m, Factored load=1500kN, Factored moment about major and minor axes are $M_{ux}=M_{uy}=40kNm$ at top and 20kNm at bottom. Use M30 and Fe415. CO3- Ana (16)

Or

- (b) Design the reinforcement in a circular column of diameter 350mm with lateral reinforcement of 8mm diameter to support a factored load of 1400 kN. The column has an unsupported length of 3.5m and is braced against side sway. Adopt M20 grade concrete and Fe415 steel bars. CO3- Ana (16)

14. (a) Write the step by step by design procedure for combined footing. CO4- U (16)
- Or
- (b) A footing has to transfer a dead load of 1000 kN and imposed load of 400 kN from a square column 400 x 400 mm. Safe bearing capacity is 180 kN /m². Design an appropriate footing for the column. Use M30 concrete and Fe 415 steel. CO4- U (16)
15. (a) Design one of the flight of a dog legged stairs spanning between landing beams using the following data. CO5- App (16)
- Number of steps in flight = 10
Tread (T) = 300 mm
Rise (R) = 150 mm
Live load = 5kN/m²
Width of landing beam 300 mm
Take $f_{ck} = 20 \text{ N/mm}^2$ and $f_y = 415 \text{ N/mm}^2$.
- Or
- (b) Write the step by step by design procedure for open newel staircase. CO5- App (16)

