Reg. No. : | | | | | | | | | | | | |

Question Paper Code : X 20307

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020

Fifth Semester

Civil Engineering

CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Write a short note on limit state of durability.
2. What is partial safety factor ?
3. Write any two guidelines to select the cross sectional dimensions of reinforced concrete beams.
4. Enumerate the advantages of flanged beams.
5. How to overcome torsion on beams ?
6. What do you understand by development length of bar ?
7. Write any two reinforcement provision in columns.
8. What is the salient condition for minimum eccentricity of column ?
9. What are forces to be considered while designing the footing ?
10. When do you prefer combined footing ?

PART – B **(5×13=65 Marks)**

11. a) Design a rectangular RC beam in flexure and shear when it is simply supported on masonry walls 300 mm thick and 5 m apart (centre to centre) to support a distributed live load of 8 kN/m and a dead load of 6 kN/m in addition to its own weight. Materials used are M20 grade of concrete and Fe 415 steel bars. Adopt working stress method of design.

(OR)

b) Design the roof slab for a Hall size 4 m × 10 m by working stress method using M20 concrete and Fe 415 steel. The slab simply resting on 230 mm thick brick walls all around. Take the live load on the slab as 1.5 kN/m^2 and finish load as 2.25 kN/m^2.

12. a) Design a T-beam section with a flange width of 1250 mm, a flange depth of 100 mm, a web width of 250 mm and an effective depth of 500 mm, which is subjected to a factored moment of 560 kNm. The concrete mix is to be used is of grade M20 and steel is of grade Fe 415. Use limit state method.

(OR)

b) Design a slab over a room 5 m × 7 m as per I.S. code. The slab is supported on masonry walls all round with adequate restraint and the corners are held down. The live load on the slab is 300 N/m^2. The slab has a bearing of 150 mm on the supporting walls.

13. a) Design the shear reinforcement for a beam 150 mm × 300 mm effective depth subjected to 15 kN/m, the span of the beam is 5 m. Take tensile reinforcement at a section is 1.2 %.

(OR)

b) Design the reinforcement required for the section 300 mm × 500 mm for the following data :

Bending moment = 65 kNm, Torsional moment = 40 kN/m, Shear force = 70 kN

14. a) Design a column having an effective length of 4.50 m to support a factored load of 1600 kN. Consider the reinforcement ratio p to be in the range 1.5 to 2.0 percent and the effective cover to longitudinal steel of 55 mm. The materials to be used are M25 grade of concrete and HYSD steel bars of grade Fe 415.

(OR)

b) A braced reinforced concrete column of circular cross-section of 500 mm diameter is to support a factored axial load of 2300 kN along with a factored moment of 165 kN/m. The unsupported length of the column is 6.3 m with effective length of 5.5 m. Design the column when it is to be provided with :

i) Lateral ties and **(6)**

ii) Spiral reinforcement. The M25 grade of concrete and HYSD steel bars of grade Fe 415. **(7)**

15. a) Design a reinforced concrete footing for a rectangular column of section 300 mm × 500 mm supporting an axial factored load of 1500 kN. The safe bearing capacity of the soil at site is 185 kN/m^2. Adopt M20 grade of concrete and HYSD steel bars of grade Fe 415.

(OR)

b) Design a combined column footing with a strap beam for two reinforced concrete columns 300 mm × 300 mm size spaced 4 m apart and each supporting a factored axial load of 750 kN. Assume the ultimate bearing capacity of soil at site as 225 kN/m^2. Adopt M20 grade of concrete and steel grade Fe 415 HYSD bars.

PART – C **(1×15=15 Marks)**

16. a) Design a rectangular footing for a column 400 mm × 400 mm to transfer an axial load of 1000 kN. The safe bearing capacity of soil is 150 kN/m^2.

(OR)

b) Design a combined footing for two columns 300 mm × 300 mm, 4 m apart to transfer an axial load of 1500 kN each. The width is restricted to 2.5 m. The safe bearing capacity of soil is 200 kN/m^2.

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