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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations (Regular) - November, 2018

Regulation: IARE – R16

## REINFORCED CONCRETE STRUCTURES DESIGN AND DRAWING

Time: 3 Hours

(CE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

### UNIT – I

- Find the ultimate moment and steel required for R/C beam section 200x450mm (effective depth). Use M20 concrete and Fe415 HYSD steel. [7M]
  - A R/C beam 300x500mm (effective depth) carry factored moment 200kN-m. Find area of steel. Assume simply supported beam at moderate exposure condition Use M25 concrete Fe415 HYSD steel [7M]
- Compare the principles of working stress method and limit state design method. [7M]
  - A rectangular beam has breadth  $b = 200$  mm, depth  $d = 400$  mm. If steel used is Fe 415 and grade of concrete is M20, find the steel required to carry a factored moment of 120 kNm. [7M]

### UNIT – II

- Explain the rules for minimum shear reinforcement in limit state design. [7M]
  - Find the ultimate bending moment of rectangular beam 200x400mm with 3nos  $16\phi$  bars in tension and 2no,  $12\phi$  bars in compression Assume clear cover top and bottom 40mm. [7M]
- Design Torsion reinforcement of rectangular R/C beam 300x600mm(effective depth) subjected to ultimate torsion moment 100kN-m and factored bending moment 200kN.m and factored shear 150kN. Use M20 concrete and Fe415 HYSD steel Detail the steel. [7M]
  - A R/C simply supported beam 300x500mm built into column (500x500mm).The beam is subjected to moment 100kN.m at support. Design suitable reinforcement and anchorage system and detail the reinforcement. Assume M20 concrete, Fe415 steel. [7M]

### UNIT – III

5. (a) Explain the design procedure for One Way Slab in Limit State Design of RCC structures. [7M]  
(b) Design a simply supported R.C.C. slab for a roof of a hall 4 m x 10 m (inside dimensions) with 230 mm walls all around. Assume a live load of  $4 \text{ kN/m}^2$  and finish  $1 \text{ kN/m}^2$ . Use grade 25 concrete and Fe 415 steel. [7M]
6. (a) Briefly discuss the procedure for design of Two way Simply Supported slab and Two way Restrained slabs. [7M]  
(b) Design a R/C slab of 3x5m supported on R/C beams 200x400mm at all four sides. Assume imposed load  $4 \text{ kN/m}^2$  and use M15, Fe415 HYSD steel and corners free to lift. Detail the reinforcement (Use limit state method). [7M]

### UNIT – IV

7. (a) Define slender, long and short R/C columns. Give the resemblance as per I.S code. Discuss the design provisions in the above scenario. [7M]  
(b) Design a R/ C rectangular short column of unsupported length 6 m fixed at both end. Assume axial load 600kN and use M20 concrete, Fe415 HYSD steel. (Column exposed to medium atmospheric conditions) [7M]
8. (a) Define uni-axial and bi-axial bending in R/C columns. Give an example resembling the location of columns in R/C framed structure. Discuss the design provisions in the context of both scenarios. [7M]  
(b) Design a rectangular R/C column with following data Axial load =300kN, Unsupported length=3m, percentage of steel =1%. Use M25 grade Concrete and Fe415 grade steel. Check the minimum eccentricity of column. [7M]

### UNIT – V

9. (a) Design a isolated footing of column 300x500mm reinforced with 6no-  $25\phi$  bars with Fe415 grade steel, M25 concrete subjected to factored axial load  $P_u = 1000 \text{ kN}$ . Assume safe bearing capacity of soil at depth of 1.2m is  $200 \text{ kN/m}^2$ . Use M25 concrete and Fe 415 grade steel. [7M]  
(b) Design doglegged stair case of head room 3mx6m for floor height 3m. Assume tread 250mm and riser 150mm and live load  $4 \text{ kN/m}^2$ . Use M20 concrete and Fe415 steel. Detail the reinforcement of stair slab. Use limit state design (steps are RCC) [7M]
10. (a) Explain the calculation of dead loads and effective depths for the staircases with detailed sketches. [7M]  
(b) Design a stair case of head room 4mx6m for floor height 3.4m. Assume tread 250mm and riser 200mm and live load  $4 \text{ kN/m}^2$ . Use M20 concrete and Fe415 steel. Detail the reinforcement of stair slab. Use limit state design (steps are RCC). [7M]