Code No: 5220AG **R15**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**M. Tech I Semester Examinations, February - 2017**
**ADVANCED REINFORCED CONCRETE DESIGN**
**(Structural Engineering)**

**Time: 3hrs** **Max.Marks:75**

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**5 × 5 Marks = 25**

1.a) Mention the codal provisions to control deflection and crack width of RC Slabs. [5]
b) What are assumptions made in theory of yield lines? [5]
c) Briefly Explain the methods available for analysis of flat slab. [5]
d) Explain about the Checking for Local Failures in a deep beam. [5]
e) Explain in detail why the Interaction diagrams are convex outwards. [5]

**PART - B**

**5 × 10 Marks = 50**

2. A simply supported reinforced concrete beam of rectangular section 230mm wide by 380mm overall depth is used over an effective span of 5m. The beam is reinforced with 3 nos.20mm dia Fe415 at an effective depth of 400mm. Two hanger bars of 10mm dia are provided. The self weight together with dead load on the beam is 5 kN/m and service live load is 8 KN/m. Using M25 grade concrete and Fe415 grade steel compute
a) Short term deflection
b) Long term deflection
c) Maximum crack width at tension face directly under bar. [10]

**OR**

3. A T - beam has the following data: width of the flange = 600 mm; breadth of beam = 230 mm. Effective depth = 450 mm; thickness of flange = 125 mm; applied moment =150 kNm. Design the beam using M25 concrete and Fe415 grade steel. [10]

4. Determine the ordinates of the bending moment diagram at every one-tenth point of beam AB of span 20 m with a uniformly distributed load 35 kN/m if the fixed moments at A is 1200 kNm and that at B is 700 kNm. [10]

**OR**

5. Using yield line theory, design the floor slab of a class room of a multi-storeyed structure for the following data. Dimensions of the class room are 7.5 m × 6 m. The panel is continuous on all edges. Assume M 20 concrete and Fe415 grade steel. Derive the formulae involved. Sketch the reinforcement details. Assume moderate exposure condition. [10]

6. Design a 6 m × 6 m wide flat slab, simply supported at the peripiery by a masonry wall 230 mm thick. Assume a live load of 5 kN/m$^2$ and finish load of 1.5 kN/m$^2$. Use direct design method. Use M 25 concrete and Fe 415 grade steel. Sketch the reinforcement details. Assume mild exposure condition. [10]

**OR**

7. Design a ribbed slab 6 x 6 m continuous over two adjacent sides simply supported on the other two sides if it is beams so that beams are spaced at 1.5 × 1.5m. Assume factored udl of 12 kN/m$^2$. Use M30 concrete and Fe415 steel. [10]

8. Design a simply supported deep beam with width = 300 mm, overall depth (D) = 3800mm,width of supports = 500mm,clear span = 6.5 m. Live load on the beam = 200kN/m at service state. Adopt M25 grade concrete and Fe415 steel. [10]

**OR**

9. Design a corbel for a 380mm square column to support an ultimate vertical load of 600kN with its line of action 200mm from the face of the column. Use M20 grade concrete and Fe 415 grade steel. [10]

10. Design a combined footing for column C1 and C2 for size 300X300mm and 450 × 450 mm carrying axial load of 1800KN and 1500 KN. The columns are space at 3m with SBC = 110KN/m$^2$ use M20 and Fe415. [10]

**OR**

11. Design a Long column of 6m length under biaxial bending with the following data :

| | | | |
|---|---|---|---|
| Size of column | = | 300 × 450 mm | |
| Concrete grade | = | M 20 | |
| Steel grade | = | Fe 415 | |
| Factored load $P_u$ | = | 1500 kN | |
| Factored moment $M_{ux}$ | = | 100 kNm ; $M_{uy}$ = | 65 kNm [10] |

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