

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2016

CIVIL ENGINEERING

**10CE6107 ADVANCED THEORY AND DESIGN OF RC STRUCTURES**

Max. Marks : 60

Duration: 3 Hours

**Part A***(Answer any two questions : 2 x 9 = 18 Marks)*

1.
  - a) Explain the stress block parameters of the concrete. (5)
  - b) Differentiate between working stress method and limit state method. (4)
2. A one way slab of effective span 4m is simply supported on 230mm thick masonry wall subjected to a live load of  $4\text{kN/m}^2$  and a surface finish of  $1\text{kN/m}^2$  is reinforced with 10mm diameter bars at 130mm c/c in short span and with distributors of 8mm diameter bars at 220mm c/c. Calculate the maximum short term deflection as per IS 456, assuming M15 concrete and Fe415 steel. (9)
3. A simply supported concrete beam of width 450mm and depth 750mm is reinforced with 3 bars of 40mm diameter. The cover for reinforcement is 40mm. calculate the crack width when the section is subjected to a bending moment of 490 kNm at the following points.
  - i. At a point midway between bars at the tension face.
  - ii. At the bottom corner of the beam. (9)

**Part B***(Answer any two questions : 2 x 9 = 18 Marks)*

4. Design an interior beam-column joint (Type I) subjected to load reversals which are no due to earthquake. Column 600mm X 600mm with 8 numbers of 25 mm diameter bars, column factored load is 1400kN. Storey height is 3m. Beams on either side are 400mm X 500mm with 3 bars of 28mm diameter on top and 3 bars of 25mm diameter on bottom. Use M25 concrete and Fe415 steel. (9)
5.
  - a) Write the comparison between two way slab and flat slab. (4)
  - b) Explain the shear strength of beam-column joint. (5)
6. Design an interior panel of a flat slab of dimension 8m X 6m. Diameter of the column is 500mm. Live load is  $6\text{kN/m}^2$  and floor finish is  $2\text{kN/m}^2$ . Provide column head and drop. Use M25 concrete and Fe415 steel. Draw reinforcement details. (9)

### Part C

(Answer any two questions : 2 x 12 = 24 Marks)

7.

- a) Explain the analysis of grid floor system by Rankines Grashoff method. (3)
- b) Design a corbel to carry an ultimate load of 600 kN at a distance of 250mm from the face of column. Size of the column is given by 400mm X 400mm. M25 concrete and Fe415 steel is to be used. Draw reinforcement details. Take bearing stress of concrete as  $0.8f_y$ . (9)

8.

- a) Derive an expression for isotropically reinforced simply supported 2 way square slab subjected to uniformly distributed load over its entire area by virtual work method. (4)
- b) A rectangular slab 3m X 5m is simply supported along shorter edges and continues over longer edges. The co-efficient of orthotropy is 0.7. The negative bending moment for shorter span 50% more than the positive bending moment. Find all design bending moments by yield line analysis. Slab thickness is 150 mm and service load is  $10 \text{ kN/m}^2$ . Take partial safety factor is 2. (8)

9.

- a) Write down the design steps of a pile cap. (4)
- b) A two span continuous beam of effective span 8m carries a factored load of  $75 \text{ kN/m}$  including self weight. Assume cross section of beam is 300mm X 850mm. Design the beam by allowing 30% redistribution of moments. Use M25 concrete and Fe415 steel. (8)