APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION, DECEMBER 2018

CIVIL ENGINEERING

STRUCTURAL ENGINEERING

01CE6107 *Advanced Theory and Design of RC Structures*

Answer any two full questions from each part. Limit answers to the required points. IS456-2000, IS13920-2016 and relevant charts for column design from SP16 are permitted. Use M35 concrete and Fe 500 steel unless noted otherwise

Max. Marks: 60   Duration: 3 hours

PART A

1. a. A rectangular simply supported beam of effective span 5 m is loaded with uniformly distributed load of "w" kN/m including the self weight. If the cross sectional dimension is 230 mm wide and 500 mm deep, find the loading corresponding to the initiation of flexural cracks?. The beam is provided with 2 bars of 20 mm diameter at the bottom of beam. Cover to reinforcement is 30 mm and diameter of links is 10 mm.   6

   b. Compare the above loading with that corresponding to the limit state moment carrying capacity of above beam.   3

2. a. Design a beam and detail its support region, subjected to a bending moment 125 kNm near the supports. Maximum shear and Torsion are 200 kN and 11 kNm respectively (All values are factored). The cross sectional dimension is 300 mm wide and 500 mm deep. Cover to reinforcement is 30 mm and diameter of links is 10 mm. Assume any other data required.   9

3. a. When a column can be considered as braced?   2

   b. Design and detail a column of unsupported length 3.6 m and effective length of 3m having the cross sectional dimension of 400 mm x 400 mm. The factored actions -axial load is 3000 kN, MUX=30 kNm and MUY=70kNm.   7

PART B

4. a. A rectangular simply supported slab of effective span 4.2 m and depth of 200mm is provided with 10 mm bars@125 C/C @ bottom . Cover to reinforcement is 25 mm. Calculate the maximum short term deflection.(Cracked Section)? Take a udl –DL 6 kN/m^2 including self weight and live load of 3 kN/m^2. 25% of the live load can be considered as permanent load. M$_{cr}$=13kNm. Assume shrinkage strain =0.0004, creep coefficient =1.6   5

   b. Briefly explain the procedure for finding the long term deflection of the above beam and how it is checked against code prescriptions?   4

5. a. Find the crack width at the soffit of the slab given in problem 4. Assume any other required data.   5

   b. Briefly explain the checks for ascertaining beam column joint strength.   4

1

6. Design and detail a rectangular shear wall of size 2400x350 mm subjected to an axial load , shear and moments as follows. (All factored)

Axial load-maximum of 5000kN   and minimum =3300 kN

Moments - maximum of 900 kNm and shear of 700 kN for seismic case   9

PART C

7. Design and detail a corbel to carry a load of 400 kN (factored) acting at a distance 200 mm away from the face of column having size 500 mm x 500 mm. Assume any other required data.   12

8. Design and detail a pile cap of 4 piles carrying a total unfactored load of 2000 kN acting at the centre of a column of 500mmx500 mm. Diameter of piles-400 mm. Pile capacity-650 kN. Centre to centre distance between piles is 3 times pile diameter. Projection of pilecap beyond pile face is 150 mm.

12

9. Using Yield-line theory, design and detail a simply supported square slab of size 5.2 m to support a floor finish load of 2 kN/m^2 in addition to selfweight and live load of 4 kN/m^2.   12