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

Question Paper Code: 12062

M.E. DEGREE EXAMINATION, APRIL 2015.

First Semester

Structural Engineering

01PSE101 - ADVANCED REINFORCED CONCRETE DESIGN

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

(Use of IS 13920, IS 456 and SP 16 are permitted)

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. List the factors affecting crack width in beams.
2. Give the mechanism of flexural cracking.
3. What is meant by slender column?
4. List the types of shear wall.
5. Mention the importance of column strip.
6. Quote the significance of Flat plate.
7. Define length of plastic hinge.
8. Write the formula for determining the curvature at a point.
9. How can we provide protection to concrete against spalling?
10. Define frequency distribution curve.

PART - B (5 x 14 = 70 Marks)

11. (a) Estimate the deflection of a cantilever beam of breadth 300*mm*, total depth of 600*mm*, span 4*m*, subjected to a maximum Bending moment due to characteristic dead and live loads of 210*kNm*, of which 60% is due to permanent loads. Assume tension steel is 1.17%, compression steel is 0.418%, cover to centre of steel is 37.5*mm*, Creep factor is 1.6, Shrinkage strain is 0.0003, Grade of concrete is M15 and grade of steel is Fe 415. (14)

Or

(b) A beam of width 450*mm*, depth 750*mm* and cover of reinforcement 40*mm* is reinforced with 3 rods of 40*mm* diameter (3780 mm^2). Calculate the crack width when the selection is subjected to BM of 490 *kNm* at the following points.

(i) At a point on the side of the beam 250*mm* below the NA
(ii) At a point midway between bars at the tension face
(iii) At the bottom corner
(iv) At the tension face directly under the belt

Assume $f_{ck} = 25N/mm^2$, $f_y = 415N/mm^2$. Use IS:456 method. $E_s = 200kN/mm^2$. (14)

12. (a) A plain concrete wall is 3*m* high, 100*mm* thick and 4*m* in length between cross walls. Design the wall if it has to carry a factored load of 600*kN* per metre length. The loads are carried to the wall through a floor at the top. Assuming that there are no openings on the wall, determine the load, the wall can carry. Take $f_{ck} = 20N/mm^2$ and $f_y = 415N/mm^2$. (14)

Or

(b) Design a corbel to carry a factored load of 500 *kN* at a distance of 200*mm* from the face of a 300 x 300*mm* column. Assume that grade M30 concrete is used for construction. (14)

13. (a) A flat plate with 7.5 x 6*m* panels on 500*mm* x 500*mm* columns has a slab thickness of 185*mm*, designed for a total characteristic load (DL+LL) of $9.3kN/m^2$. Check the safety of the slab in shear if grade M25 concrete and grade Fe 415 steel are used for its construction. How can we increase the shear capacity of the slab? (14)

Or

(b) Design the interior panel of a flat slab floor system for a warehouse 24*m* x 24*m* divided into 4 panels each of 6*m* x 6*m*. The live load is 5 kN/m^2 and the column size is 400*mm* diameter. Use M20 grade of concrete and Fe415 grade of steel bars. Sketch the reinforcement details in the interior panel of the flat slab. (14)

14. (a) The following are the details of an internal beam column of type 1 joint, subjected to reversals which are not due to earthquakes. Column 600 x 600*mm* with 8 no's of 25*mm* bars, column factored load is 1400 *kN*, storey height is 3*m*, beams on either side are 400 x 500 with 3 bars of 28*mm* (1846 mm^2) on the top and 3 bars of 25*mm* (1473 mm^2) at the bottom. Assume f_{ck} = 25 N/mm^2 and f_y = 415 N/mm^2. Design the joint. (14)

Or

(b) Write the step by step procedure of Bakers method of plastic design with its formulae. (14)

15. a) A reinforced concrete slab is 150*mm* thick with 20*mm* cover to center of steel. If the positive steel reinforcement is 500 mm^2/m. determine the approximate moment curvature. Determine the ductility factor assuming M30 concrete and Fe250 steel for reinforcements. (14)

Or

(b) Discuss about the quality control of concrete. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) Design a shear wall of length 4.16*m* and thickness 250*mm* subject to the following forces. Assume f_{ck} = 25 N/mm^2, f_y= 415 N/mm^2 and the wall is a high wall with the following loadings. (10)

Loading	Axial force (*kN*)	Moment (*kNm*)	Shear (*kN*)
DL + LL	1950	600	20
Seismic load	250	4800	700

Or

(b) A walkway consists of a slab 5.4*m* between edges supported on spandrel beams 200 x 600*mm* in size, which in turn is carried on 300 x 200*mm* columns spaced at 7*m* centers. Assuming that the total factored load on the walkway is 6 kN/m^2 and the slab thickness is 150*mm*, determine the design torsional moment in the spandrel beams and the walkway slab. Use M25 grade of concrete. (10)

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