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

Question Paper Code: 12062

M.E. DEGREE EXAMINATION, OCTOBER 2014.

First Semester

Structural Engineering

01PSE101 - ADVANCED REINFORCED CONCRETE DESIGN

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

(Use of IS 456, IS 13920, IS1893 (Part I) and SP16 are permitted, Missing data if any can be suitably assumed.)

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. List out the various design concept of limit state.
2. Reason out why under reinforced sections are preferred.
3. Explain how the stiffness of shear wall can be calculated.
4. What is the function of horizontal steel in a corbel?
5. List the assumptions made in yield line analysis.
6. Differentiate voided slab and grid floor.
7. Why moment redistribution is limited when percentage of steel is higher?
8. List the assumptions made in Baker’s method of plastic design.
9. What are factors to improve ductility performance of a RC member for seismic loading?

10. Draw the stress strain curve for confined and unconfined concrete.

PART - B (5 x 14 = 70 Marks)

11. (a) Design a reinforcement for a T – beam for the following data.

Span – 8m, Ends simply supported
Spacing of beams – 3m,
Super imposed load – 5kN/m^2
Floor finish – 0.7kN/m^2
Thickness of slab – 130mm
Weight of wall on beam – 15kN/m
Assume width of web 230mm, Total depth – 680mm
Take concrete grade M 20 and Steel Fe415. (14)

Or

(b) A beam of cross section 250 x 450mm is reinforced with 4 bars of 20mm with an effective cover of 50mm. The effective span of the simply supported beam is 6m. Check whether the depth provided is satisfactory from deflection using empirical formula and calculate the crack width under any one bars in the beam if BM is 70kNm. Take M20 grade of concrete and Fe415 steel. (14)

12. (a) Design a shear wall of length 5.16m and thickness 250mm subject to the following forces. Assume f_{ck} = 20 and f_y = 415N/mm^2 and the wall is a high wall with the following loadings (14)

S. No	Loading	Axial force (kN)	Moment (kNm)	Shear (kN)
1	Dl +LL	1950	600	20
2	Seismic load	250	4800	700

Or

(b) Design a corbel to carry a girder section of 300kN at a distance of 200mm from the face of the column of size 300 x 300mm. Use M 20 grade concrete and Fe415 steel. (14)

13. (a) Design the interior panel of a flat slab of size 6m x 6m without drop to support live load of 50 kN/m^2. The floor system is supported by columns of size 500mm x 500mm. Floor to floor distance is 3.6m. Use M20 concrete and Fe415 steel. (14)

Or

(b) Design a simply supported square slab using yield line theory of side 3.5m to carry a service load of 3kN/m^2. Use M20 grade concrete and Fe415 steel. (14)

14. (a) (i) Explain the moment – curvature relationship with the following terms: Elastic stage, Elasto plastic stage and fully plastic stage. (7)

(ii) Design a 8m RC rectangular beam fixed at supports, subjected to service loads of 20 kN/m dead load and 60kN concentrated load at its centre by Baker's method. Use M20 concrete and Fe250 steel. Take $E_s = 2 \times 10^5$ N/mm^2. (7)

Or

(b) Design a rectangular slab 8m in the X direction and 5m in the Y direction has fixed edges and carries a factored load of 20 kN/m^2. Use Hillerbrerg's strip method. (14)

15. (a) A Beam AB is to be designed for moments M_A = -69 kNm and +23kNm, M_B = 88 kNm and +3 kNm. The characteristic dead and live loads are 10 and 5 kN/m respectively. The span is 6m, beams are 300mm X 500mm with 150mm slab. Assume M20 concrete and Fe415 steel. The structure is situated in seismic zone IV. Design should be made according to the provisions if IS 13920. (14)

Or

(b) Describe the effects of fire on building and structural remedies to be provided for its resistance. Explain how to determine the loss in strength due to fire. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) Explain ductile detailing of beams and columns as per IS 13920. (10)

Or

(b) (i) Explain the various methods of analysis of grid floors. (5)

(ii) Draw a neat sketch of detailing of grid floor. (5)
