Government College of Engineering Aurangabad
(An Autonomous Institute of Government of Maharashtra)
B. E. (Civil Full Time-Rev) Examination
End Semester Examination Nov 2016
AM 443 DESIGN OF CONCRETE STRUCTURES-II

Time: Three Hours 18 NOV 2016 *Max. Marks: 60*

" Verify the Course Code and check whether you have got the correct question paper"

N.B:-
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if necessary and state it clearly.
4. Use of non-programmable calculator is allowed.
5. Use of Indian Standard Codes 456, 1893, 13920, 1343 is allowed.

Q1: (a) State the assumptions used in yield line theory for analysis and design of RCC slabs.

OR

A simply supported RCC slab, square in plan, has its four sides of 4 m length. It carries a transverse uniformly distributed load of intensity 9 kN/m^2 on its whole plan area. If central deflection of this slab under the mentioned load is 30 mm, calculate the work done by this load. (4)

(b) Consider a rectangular RCC slab having length and width 6 m and 4 m respectively, and draw a likely pattern of positive and negative yield lines when it is loaded till its failure under ultimate udl applied over its full area. The slab is fixed along its all four edges. Calculate the work done by ultimate load of 10 kN/m^2 intensity if central deflection in the slab is 30 mm. (4)

(c) A simply supported RCC circular slab of diameter 5 m is having its thickness of 150 mm. Calculate the amount of reinforcing steel required for this section if its moment of resistance needed is 20 kNm. Assume M20 & Fe415 materials, and 20 mm effective cover. (4)

Q2: (a) Describe behavior of a typical 'flat slab' type RCC building structure with sketches. (4)

OR

Explain the Direct Design Method used for design of a flat slab. (4)

(b) Draw neat sketches to show positions of critical sections for shear, in plan of a flat slab, supported by columns having square, rectangular, circular and 'L' type of cross-sections.

(c) A three-span continuous flat slab having spans AB, BC, and CD, each of 6 m c/c, is subjected to hogging moments at supports A, B, C, and D of 96.8, 332, 332, and 96.8 kNm respectively, whereas the sagging moments near mid-spans of AB, BC, and CD are 250, 162, and 250 kNm respectively. If a designer has given 12 ø @300 for section A, 12 ø @150 for section B, and 12 ø @200 for mid-span of AB, show details of this prescribed reinforcement in the flat slab in a neat sketch. (4)

Q3: (a) Explain the concept of 'equivalent bending moment' and 'equivalent shear force' used in design of RCC beam subjected to bending, torsion and shear simultaneously.

OR

A plain concrete beam of M20 grade having section of 300 x 500 mm size has a shear strength of 0.894 MPa. Find its cracking torque given by $T = \frac{1}{2} \tau b^2 \left(D - \frac{b}{3} \right)$ (4)

(b) In a RCC water tank circular in plan, its bottom ring girder is supported by eight columns spaced equidistantly, forming eight segments of the girder. Discuss the loads expected on this girder, and draw typical bending moment diagram, shear force diagram, and torsional moment diagram for any one segment of this ring girder. (4)

(c) Find amount of longitudinal steel in a section of a RCC ring beam 500 mm wide and 700 mm deep subjected to a bending moment of 130 kNm, twisting moment of 10 kNm and a shear force of 130 kN at ultimate. Use M20 concrete and Fe 415 reinforcing steel. Assume effective cover of 35 mm. (4)

Q4: (a) Define 'prestressing' technique adopted in concrete structures. Mention advantages and disadvantages found in this technique.

OR

Discuss various types of losses observed in prestressed concrete members. (4)

(b) Mention any four popular methods of post-tensioning concrete members. Explain any one of them with sketches. (4)

(c) A beam of 150 x 300 mm is prestressed by a force of 250 kN by steel cables located at an eccentricity of 60 mm below the centroidal axis. Determine loss of prestress due to creep of concrete using the expression 'm.θ.σ' where 'm' is modular ratio, θ is creep coefficient equal to 2, and σ is the resultant stress in concrete at the level of the prestressing steel. Take m = 6.62 (4)

Q5: (a) Write a short note on various structural systems commonly adopted in multi-storeyed buildings.

OR

Explain the necessity of redundancy in structural arrangement of a multistoreyed building. (4)

(b) What are the different types of primary loads and various load combinations recommended for analysis of multistoreyed buildings? (4)

(c) The computer aided analysis of a plane frame taken from a RCC multistoreyed building gave the following data:

Member No.	Joint No.	Structural Actions	Load Case 1	Load Case 2	Load Case 3	Load Case 4	Load Case 5	Load Case 6	Load Case 7
17	2	Axial	-17.71	24.43	3.35	-26.41	8.31	-20.95	13.77
		Shear	+118.7	126.2	136.2	38.94	142	2.76	105.8
		Moment	+87.71	-114.9	191.9	-85.45	219.1	-112.3	192.3
	7	Axial	+17.71	-6.985	-3.35	26.41	-8.31	20.95	-13.77
		Shear	+106.2	8.14	43.76	132.6	29.52	100.2	-2.92
		Moment	-58.84	0.46	20.72	-130	39.62	-111.7	57.86

Point out the design bending moment, shear force, and axial force for support sections of the member 17 from this data. (4)

----------END----------