Government College of Engineering Aurangabad

(An Autonomous Institute of Government of Maharashtra)

B. E. (Civil Full PartTime) Examination

End Semester Examination Nov 2016

AM 403 DESIGN OF RCC 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) While applying virtual work method for analysis of a RCC slab, the relation between ultimate load intensity 'w' and the location 'x' of an yield line in it is found to be $w = \frac{93}{x} - 12 + \frac{45}{4-x}$. For obtaining minimum value of this 'w' load, if the corresponding equation is $x^2 - 15.5x + 31 = 0$, find the value of this 'w' load.

OR

Discuss the sequence of formation of positive and negative yield lines in case of a 1 m wide fixed RCC slab of span L when it is subjected to uniformly distributed type of load. If w_1 udl causes yielding at supports, and w_2 udl causes yielding at center of the span, find the relation between w_1 and w_2 loads. (4)

(b) In a simply supported circular RCC slab, the net values of radial and circumferential bending moments are found as follows (+ Sagging; - Hogging):

R (m)	0	2	3	4.5	5	6
M_r (kNm)	170.8	91.75	7.0	-229.3	-110.7	0
M_θ (kNm)	170.8	144.50	111.5	37.5	16.0	6.2

Find amount of steel required for the maximum sagging circumferential moment in this slab taking its effective depth of 340 mm. Use M20 and Fe 415 steel. (4)

(c) If ultimate moment of resistance required at a 1 m wide section in a RCC slab is 16 kNm, calculate amount of steel required in it using M20 concrete and Fe415 reinforcing steel, taking effective depth of 100 mm.(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) The total design load in a panel of flat slab of size 8 x 6 m is W=541 kN. If clear spacing between the column heads L_n is 6.94 m, calculate the absolute sum of positive and negative bending moments in the panel. If it is an interior panel, what will be magnitudes of these positive bending moment and negative bending moment in it? (4)

(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. Draw a proportionate BMD for this flat slab. (4)

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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) Find spacing of 8 mm 2-legged stirrups in 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, and shear strength of concrete 0.35 N/mm^2. Use $0.87 \sigma_y A_{sv} = \frac{T_u x}{b_1 d_1} + \frac{V_u x}{2.5 d_1}$ equation. (4)

(c) In a RCC beam, as a result of shearing action due to transverse loads and torsional moment, the nominal shear stress at a section is 0.23 N/mm^2. If shear strength of that section is 0.36 N/mm^2, what would be spacing of 8 mm diameter 2 legged shear reinforcement (made of mild steel) required in the beam? (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) A pre-tensioned type of concrete beam is prestressed with an initial prestress of 500 MPa. Assuming shrinkage strain of 3 x 10^{-4} in the concrete, and modulus of elasticity of the prestressing steel 200 GPa, calculate the percentage loss of prestress. (4)

(c) Define 'pressure line' in a prestressed concrete beam. Show its position on mid-span section of a simply supported hypothetic weightless concrete beam subjected to only a concentric prestressing force of magnitude P kN. The size of the cross-section of the beam is b x D. (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) Discuss any one method, as per 1893-2000 code, for calculation of design lateral loads on a rcc building frame. (4)

(c) The ultimate design values for bending moment and shear force at a support section of a beam in a structure are 112.3 kNm and 184.04 kN respectively. Design the section if material to be used is M20 concrete with shear strength of 0.44 N/mm2, and Fe415 steel. Assume any other suitable data needed stating it clearly. (4)

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