Code : 011617

B.Tech 6th Semester Exam., 2019

DESIGN OF CONCRETE STRUCTURE—I

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are ***NINE*** *questions in this paper.*

(iii) Attempt ***FIVE*** *questions in all.*

(iv) Question No. ***1*** *is compulsory.*

1. Choose the correct answer of the following (any *seven*) : 2×7=14

(a) Deflection can be controlled by using the appropriate

(i) aspect ratio

(ii) modular ratio

(iii) span/depth ratio

(iv) water/cement ratio

(b) In limit state approach, spacing of main reinforcement controls primarily

(i) collapse

(ii) cracking

(iii) deflection

(iv) durability

(c) The limiting compressive strain of concrete in bending is

(i) 0·0035

(ii) 0·0015

(iii) 0·0025

(iv) 0·015

(d) In case of 2-way slab, limiting deflection of the slab is

(i) primarily a function of the long span

(ii) primarily a function of the short span

(iii) independent of long or short spans

(iv) dependent on both long and short spans

(e) In case of deep beam or thin webbed RCC members, the first crack form is

(i) flexural crack

(ii) diagonal crack due to compression

(iii) diagonal crack due to tension

(iv) shear crack

(f) Drop panel is a structural component in

(i) grid floor

(ii) flat plate

(iii) flat slab

(iv) slab-beam system of floor

(g) Torsion resisting capacity of a given RC section

(i) decreases with decrease in stirrup spacing

(ii) decreases with increase in longitudinal bars

(iii) does not depend upon stirrup and longitudinal steels

(iv) increases with the increase in stirrup and longitudinal steels

(h) In limit state design, permissible bond stress in the case of deformed bars is more than that in plain bars by

(i) 60%

(ii) 50%

(iii) 40%

(iv) 25%

(i) Shear span is defined as the zone where

(i) bending moment is zero

(ii) shear force is zero

(iii) shear force is constant

(iv) bending moment is constant

(j) The probability of failure implied in limit state design is of the order of

(i) 10^{-2}

(ii) 10^{-3}

(iii) 10^{-4}

(iv) 10^{-5}

2. *(a)* What is the purpose of serviceability requirement? 7

(b) Distinguish among the working stress method, ultimate load design and limit state design. 7

3. *(a)* What are the various assumptions on which the design for the limit state of collapse in flexure is based? 7

(b) Under what circumstances are doubly reinforced used? What are the advantages of doubly-reinforced beams over singly-reinforced beams? 7

4. What are the three assumptions made for design of reinforced concrete section for limit state of collapse in flexure that lead to the limiting value of neutral? Calculate the limiting values of depth of neutral axis in terms of effective depth of section for two grade of steel having yield strengths $f_y = 250\ N/mm^2$ and $415\ N/mm^2$. 14

5. A rectangular RC section 25 cm wide and 50 cm overall deep is reinforced with 3 mm–16 mm diameter HYSD bars at an effective cover of 4 cm from bottom face. If permissible stresses in concrete in bending compression and steel are $50\ kg/cm^2$ and $2300\ kg/cm^2$ respectively, modular ratio $m = 19$, calculate the moment of resistance of section using WSM. 14

6. Explain 'under-reinforced', 'balanced' and 'over-reinforced' sections in the ultimate load theory. 14

7. Design the RC floor slab for a room of internal dimensions of 4·0 m × 9·5 m. Assume the slab to be simply supported on 230 mm thick masonry walls. The slab is to support live load of $4{\cdot}0\ kN/m^2$ and surface finish of $1\ kN/m^2$. Use M-20 grade concrete, HYSD steel of Fe-415 grade. Draw reinforcement in detail. 14

8. Design a reinforced concrete column which is 4·5 m long and fixed at both ends. It is carrying an axial load of 2000 kN. Use M-25 concrete and Fe-415 steel. 14

9. A simply supported beam of 5 m effective span is subjected to 24 kN/m live load. $f_{ck} = 20\ N/m^2$, $f_y = 415\ N/mm^2$. The overall depth of the beam is 400 mm and width is 250 mm. Design the reinforcement of the beam, if $K = 0 \cdot 138$, $j = 0 \cdot 80$. 14

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