5E3152-P

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B. Tech. (Sem. V) (Main/ Back) Examination, December - 2011
Civil Engg.
5CE2 Concrete Structures - I

Time : **3** Hours] [Total Marks : **80**
[Min. Passing Marks : **24**

Instructions to Candidates :

Attempt any ***five questions*** *selecting* ***one question*** *from* ***each unit****. All questions carry* ***equal*** *marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. **IS 456 : 2000** 2. **Nil**

B. Use limit state Design, unless specified specifically.

UNIT - I

1 (a) Describe the salient features of "Working stress Design Philosophy" and "Limit State Design Philosophy". 4

(b) Determine the area of tension reinforcement required for a singly reinforced beam section of size 300 x 600 mm (overall) to carry a factored moment of 175 kN/m. Use M-20 and Fe-415. Also show the detailing of reinforcement in cross section of beam. 12

OR

1 (a) Draw the strain and stress block parameters for a under-reinforced doubly reinforced E rectangular beam section and write the formula to calculate the moment of resistance of the same. Also describe each and every term used in the formula. 6

(b) Determine the ultimate moment of resistance of the following T-beam section, having M-20 concrete and Fe-415 steel.
Flange width = 1200 mm
Flange depth = 90 mm
Overall Depth of T-beam = 650 mm
Web width = 240 mm
Area of tension steel (provided at an effective cover of 50 mm) = 2000 mm^2.
Draw the neat sectional sketch showing strain and stress block parameter and neutral axis depth.

10

UNIT - II

2 (a) Determine the "Ultimate shear strength" of the support section shown in Fig. 1 by using limit state.

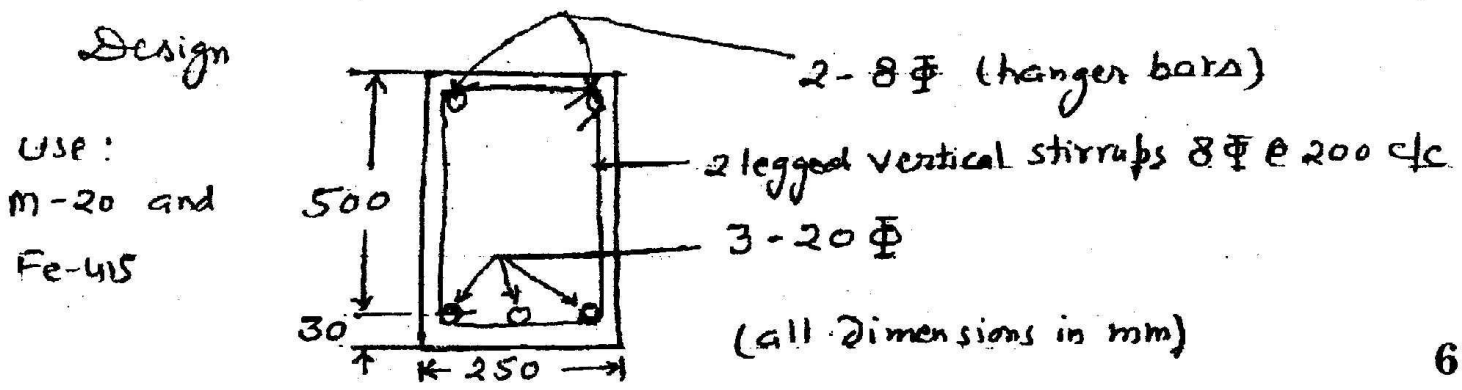

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Fig. 1

(b) A simply supported beam spanning over 8m effective span is of rectangular section 300 x 600 mm overall. The beam is reinforced with 4 bars of 25 mm diameter on tension side at an effective cover of 50 mm. Two nominal hanger bars of 12 mm diameter are provided on the compression side. The beam is subjected to a service moment of 140 kN.m at the centre of span section. Use M-20 and Fe-415 and check the beam for the serviceability of deflections using theoretical method as per IS 456 : 2000.

10

OR

2 (a) A rectangular beam with width of section = 350 mm and effective depth = 550 mm has a factored shear of 400 kN at the critical section near support. The beam is reinforced with 4-32 Φ (Fe-415) which are continued to support. Use M-25 grade of concrete. Design shear reinforcement at support using 2-legged vertical stirrups of 10 mm diameter (Fe-415).

8

(b) A Hall of 4m x 9m is to be converted with a R.C.C. roof slab of 180 mm thick. Design the slab using :
M-25 grade of concrete, Fe-415 grade of steel service live load 4 kN/m^2, Dead load (including self weight of slab) = 5.5 kN/m^2.
Assume effective span of slab as 4.16 m.
Design the slab and show the reinforcement detail in plan and section.

8

UNIT - III

3 Design a two-way slab (200 mm thick) which is simply supported on all the four walls of a hall with effective span of 6.3 m and 4.5 m. Assume service live load
= 10 kN/m^2 and dead load (including self weight)
= 5 kN/m^2. Use M-25 grade of concrete and Fe-415 grade of steel.
(i) determine, provide and show the reinforcement along short and long span
(ii) check the slab for deflection using empirical method (IS : 456 : 2000).

12+4

OR

3 (a) The interior panel of a flat slab is of 6m x 6m. The thickness of slab = 150 mm, thickness of drop = 200 mm column head diameter = 1.5 m, Drop width = 3m. The slab is subjected to total ultimate bending moment (M_o) = 230 kN.m. Distribute the moments in column and middle strips and show them in neat plan.

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(b) In the Fig. 2, discuss the provisions for torsion reinforcement in panel (1) at corner A, B and C. Draw the neat sketch showing detailing of torsion reinforcement of these corners if the main reinforcement is as below :

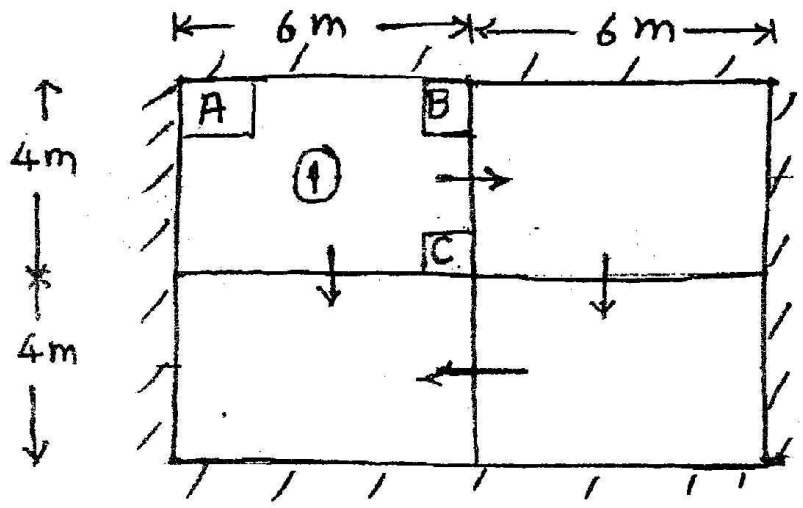

Fig. 2

(i) along shorter span –ve reinf. = 360 mm^2
+ve reinf = 240 mm^2
(ii) along longer span –ve reinf. = 220 mm^2
+ve reinf. = 200 mm^2

8

UNIT - IV

4 (a) Write a short note on Pu-Mu interaction curve and their use in designing the column.

6

(b) Determine and provide the longitudinal reinforcement and lateral ties in a column of size 550 x 425 mm. Also check the column for minimum eccentricity if the unsupported length of column is 3m. Use M-20 and Fe-415. The column is subjected to ultimate axial load of 2500 kN.

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OR

4 (a) A reinforced concrete short column of 480 mm diameter is reinforced with 6-20 Φ (Fe-415) and 8 mm Φ helix with 75 mm pitch. Compute the maximum load carrying capacity of the column if concrete is of M-25 grade.

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(b) Describe the "balanced failure", "compression failure" and "tension failure" of a short column subjected to axial load and uniaxial moment.

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UNIT - V

5 Design an isolated footing for a square column, 400 mm x 400 mm with 12-20 Φ (Fe-415) longitudinal bars, carrying service axial load of 1500 kN. The safe bearing capacity of soil is 250 kN/m^2 at a depth of 1m below the ground level. Use M-20 and Fe-415. Draw the neat sectional elevation and plan showing reinforcement detailing.

16

OR

5 Two columns having cross section of 250 x 250 mm and 300 x 300 mm are loaded with 300 kN and 500 kN service loads respectively. The centre to centre distance between the column is 4m and the safe bearing capacity of soil is 100 kN/m^2. Design the combined rectangular footing if the width of footing is restricted to 1.5 m. Use M-20 and Fe-415.

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