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Code No: 125AB **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, November/December - 2017
REINFORCED CONCRETE STRUCTURES DESIGN AND DRAWING
(Common to CE, CEE)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A **(25 Marks)**

1.a) What is meant by modular ratio? Why it is considered to be an unreliable quantity? [2]

b) Why do continuous T beams at supports have to be designed as rectangular beams? [3]

c) Why is limitation of deflection in a structure called a serviceability condition? Name another serviceability condition commonly used in limit state design. [2]

d) Explain the terms development length, lap length and anchorage lengths. [3]

e) What is the function of providing distribution steel in a slab? [2]

f) Explain clearly the difference in the behaviour of one way slab and two way slabs. [3]

g) What is meant by slenderness ratio of a compression member and what are its implications? [2]

h) Why does code specify limits to the minimum and maximum reinforcement in columns? [3]

i) What are the situations in which combined footings are preferred to isolated footings? [2]

j) Why is it desirable to eliminate eccentricity in loading on a footing, wherever possible, by means of proper proportioning? [3]

PART - B **(50 Marks)**

2. Determine the moment of resistance of T beam section with the details given below: $b_w = 200$ mm, $d = 600$ mm, $b_f = 1500$ mm, $D_f = 120$ mm, $A_{st} = 2415$ mm^2, $f_{ck} = 25$ MPa, $f_y = 500$ MPa. [10]

OR

3. A rectangular beam width 350mm and effective depth 550mm has a factored shear of 400 kN at a section near the support. The steel at the tension side of the section consists of 4 - 32mm diameter bars which are continued into the support. Assume $f_{ck} = 20$MPa and $f_y = 415$ MPa. Design vertical stirrups for the section. [10]

4. A simply supported reinforced concrete beam of effective span 5.2 m has cross section 300 mm × 450 mm overall depth is reinforced with 3 bars of 20 mm diameter in tension and 2 bars of 12mm diameter in compression. The beam is subjected to a superimposed working load of 25 kN/m. Determine the short term deflection and long term deflection. Adopt M20 grade of concrete and Fe 415 HYSD steel. [10]

OR

5.a) Give the step by step procedure of calculating the crack width of a RC beam according to IS 456 – 2000

b) Under what situations do the following modes of cracking occur in reinforced concrete beams: (i) flexural cracks, (ii) diagonal tension cracks, (iii) flexural-shear cracks and (iv) splitting cracks? [5+5]

6. A one-way slab has been designed for a simply supported effective span of 4.6 m with an overall depth of 160 mm and clear cover of 20 mm, M25 concrete and Fe 500 steel. The dead loads are taken as 4.0 kN/m^2 and the live loads as 2.0 kN/m^2. The longitudinal bars are designed as 12 mm dia @ 150 c/c. Verify the adequacy of the thickness provided, a) Applying the limiting span/effective depth ratio; b) Actual calculation of total deflections. [10]

OR

7. Design a continuous RC slab for a hall 5.0 m × 12.5 m. The slab is supported on RCC beams, each 240 mm wide which are monolithic. The ends of the slab are supported on walls, 300 mm wide. Design the slab for a live load of 2 kN/m^2. Assume the weight of floor finishing equal to 1.5 kN/m^2. Adopt M20 concrete and Fe415 grade steel. Use Limit state method. [10]

8. Design a rectangular concrete column to carry an axial load of 1000kN. The actual length of column is 5.80m. The column is restrained at position and direction at its both ends. M20 grade of concrete and Fe 415 HYSD steel bars are to be used. Adopt the permissible stresses in direct compression for concrete and steel as specified in IS:456-2000. [10]

OR

9. Design a bi-axially eccentrically loaded braced rectangular reinforced concrete column deformed in single curvature for the following data:
Ultimate axial load P_{cu}=1000 kN
Ultimate moment in longer direction at bottom M_{cux1}=110 kN-m and at top M_{cux2}= 80 kN-m
Ultimate moment in shorter direction at bottom M_{cuy1}=40 kN-m and at top M_{cuy2}= 30 kN-m
Size of the column (bxD) = 300 mm × 480 mm
Unsupported length of column l_u=5.80m
Effective length in the long direction l_{ex}=5.40 m
Effective length in the short direction l_{ey}=4.20 m
M20 grade of concrete and Fe 415 HYSD steel bars shall be used [10]

10. A column 450 × 450 mm in size with 8 steel bars of 18mm diameter transfer a dead load of 620kN and a live load of 860 kN to the footing. The bearing capacity of soil is 120 kN/m^2. M20 grade of concrete and Fe 415 HYSD steel bars shall be used. Design a square footing to support the column. [10]

OR

11. The stair with an open well consists of two flight and a span partly crossing at right angles. There are ten steps of rise 160mm and tread 250mm in each flight and six such steps in cross span. The width of the landings and stairs is 1200mm. The landings are supported on the walls at the ends. Design the stair slab. Provide M20 grade of concrete and Fe 415 HYSD steel bars. [10]

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