

B.E. DEGREE EXAMINATIONS: APRIL/ MAY 2010

Sixth Semester

CIVIL ENGINEERING

U07CE605: Design of Reinforced Concrete Elements

(Use IS456:2000 and SP16 are permitted. Adopt limit state design unless otherwise stated)

Time: Three Hours

Maximum Marks: 100

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. As per IS456:2000, the value of modulus elasticity of concrete is
a) $5000 f_{ck}$ b) $5000 \sqrt{f_{ck}}$ c) $4000 \sqrt{f_{ck}}$ d) $4000 f_{ck}$
2. Partial safety factor for material strength of concrete under ultimate limit is
a) 1.15 b) 1.50 c) 1.2 d) 1.00
3. The R C Sections in bending fail when the compressive strain in the concrete reduces the value is
a) 0.0250 b) 0.035 c).0035 d) 0.0025
4. As per IS456:2000, Minimum cover for RCC slab is
a) 15mm b) 20mm c) 25mm d) 40mm
5. Development length of bars (Ld) compression is
a) $(\pi 0.87 f_y \Phi^2) / 4$ b) $(\pi 0.87 f_y \Phi^2) / 4 \zeta_{bd}$
c) $(0.87 f_y \Phi) / 4 \zeta_{bd}$ d) $(0.87 f_y \Phi) / (4 \times 1.25 \times \zeta_{bd})$
6. Minimum area of shear reinforcement
a) $0.4 b S_v / (0.87 f_y)$ b) $(0.87 f_y) / (0.4 b S_v)$
c) $0.4 f_y b / (0.87 S_v)$ d) $(0.87 b S_v) / (0.4 f_y)$
7. What is the minimum number of bars used for circular and rectangular column?
a) 4, 4 b) 4, 6 c) 6, 6 d) 6, 4
8. In axially loaded column it's one having it's resultant acting position of the column section is
a) Centre of gravity b) Centre c) Centroid d) Natural Axis
9. How much permissible punching shear stress in concrete is usually taken for the ordinary shear strain?
a) Twice b) Thrice c) Four times d) 30cm
10. What is the minimum footing thickness of the edge in RCC or plain concrete with respect to footing on soil?
a) 10cm b) 15cm c) 20cm d) 30cm

PART B (10 x 2 = 20 Marks)

11. Draw the stress-strain curve for Concrete.
12. State the Difference between characteristic load and characteristic strength.
13. Sketch the edge and middle strips of a two way slab.
14. Write down the minimum and maximum steel used in flanged beams.
15. What are the various types of shear failure in beams?
16. Define local bond.
17. Draw a neat sketch of uniaxial bending and biaxial bending of column under direct load and moment.
18. Differentiate between long and short columns.
19. How do footings differ from one way footing and two-way footing.
20. Under what circumstances combined footing is adopted.

PART C (5 x 14 = 70 Marks)

21. a) Determine the reinforcement for a beam with, web width 300mm, effective depth is 735mm to carry a moment of 380kNm. Use Working stress method. Assume $f_{ck} = 20\text{N/mm}^2$ and $f_y = 415\text{steel}$.

(OR)

- b) What are the advantages and disadvantages of RC members by Working stress method.

22. a) Design the interior span of a continuous one-way slab for an office floor over beams spaced at 4m centers. Assume $f_{ck} = 25\text{N/mm}^2$ and $f_y = 415\text{steel}$.

(OR)

- b) Determine the reinforcement required for a beam width 300mm and overall depth 600mm to carry a moment of 320kNm. Assume $f_{ck} = 20\text{N/mm}^2$ and $f_y = 415\text{steel}$.

23. a) A reinforced rectangular beam has a breadth of 350 mm and $d=800\text{mm}$. It has factored shear force of 105kN and $B_m = 30\text{kNm}$. And torsional moment = 15kNm. Determine the steel required. Use M_{25} $f_y = 415$.

(OR)

- b) Design the shear reinforcement required for a beam of size 300 x 500 mm subjected to a factored shear force of 155kN. It is reinforced with 3 numbers of 20mm diameter. Use M_{20} and $F_e = 415$.

24. a) A column is 300x400mm has an unsupported length of 3m and effective length of 3.6m. It is subjected to $P_u=1100\text{kN}$ and $M_u=230\text{kNm}$. Determine the reinforcement using $f_{ck}=25\text{N/mm}^2$ and $f_y = 415\text{steel}$.

(OR)

b) Design a circular column 400mm dia and helically reinforced with an unsupported length of 4.5m to carry a factored load of 900kN. Assuming that $f_{ck}=30$ and $f_y = 415\text{steel}$.

25. a) A solid footing has to transfer a dead load of 1000kN and an imposed load of 400kN from a square column 400x400mm. The safe bearing capacity of soil is 200kN/m². Design the Footing. Assuming that $f_{ck}=20$ and $f_y = 415\text{steel}$.

(OR)

b) Write down the step by step procedure for the design of rectangular combined footing.
