B.E Civil VII CBGS 24.11.16 (14)

LSMRCS

QP CODE : 841800

N.B. **(3 HRS)** **Marks: 80**

1. Question no. **1 is compulsory**. Attempt any **THREE** out of remaining **FIVE** questions.
2. Assume suitable data **if necessary** but justify the same.
3. Use of IS code is **NOT** permitted.

Q.1 Attempt any **FOUR.** **20**

a. State four assumptions made in the Limit State of Collapse (flexure) in RCC. Also draw strain and stress diagram across the section. (5)

b. What is the necessity of providing shear reinforcement? What are the various forms of shear reinforcement/ (5)

c. How can we increase the bond between steel and concrete? (5)

d. Write any three points of differences between limit state method and Ultimate Load Design method in RCC. (5)

e. What is combined footing? When it is to be provided? What are the various types of combined footings? (5)

f. What are the functions of providing distribution steel in slab? (5)

Q.2 Attempt the following. **20**

a. Determine the ultimate moment of resistance for the beam having dimensions 300mmX 550 mm (effective), if it is provided with minimum tension steel reinforcement. Use LSM and material combinations are (i) M_{25} concrete and Fe_{415} steel.(ii) M_{20} concrete and Fe_{250} steel. (10)

b. A beam of size 300 x 500 mm overall, is subjected to a factored bending moment of 320 kNm .Compute the reinforcement required at an effective cover of 50 mm to compression and tension reinforcement. Use M 25 concrete and Fe 415 steel. (10)

d'/d	0.05	0.100	0.15	0.20
f_{sc} (MPa)	355	353	342	329

Q.3 Attempt the following. **20**

a. A reinforced concrete beam of 300 x 550 mm overall is reinforced with 5 bars of 20 mm φ HYSD steel of grade Fe 500, placed at an effective cover of 50 mm. The beam carries a factored UDL of 150 kN/m over a simply supported clear span of 5 m. Design the shear reinforcement if 2 bars are bent upward near support. Use M 25 concrete. Also sketch the shear reinforcement details. Width of the support may be taken as 300mm.Use the following design shear strength values for concrete. 10

pt%	0.50	0.75	1.0	1.25	1.5	1.75
τ_c MPa	0.49	0.57	0.64	0.70	0.74	0.78

b. A tee beam having 1150 mm effective width of flange has a thickness of flange equal to 100 mm. The effective depth of the beam is 500 mm and width of the web is 300 mm. It is reinforced with 2 bars of 25 mm φ and 4 bars of 20 mm φ on the tension side. Determine moment of resistance if M 25 concrete and Fe 415 steel is used for construction. Use LSM. (10)

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Q.4 Attempt the following. **20**

a. A hall of a residential building measures 4.25 m x 5.9 m. It is supported by 300 mm thick wall on all four sides. Design the simply supported slab using M 20 and HYSD Fe 415 steel. Assume the live load on the slab as 4kN/m^{2}and the floor finish load as 1kN/m^2.Apply checks for shear, deflection and development length. Sketch the reinforcement details along both spans. (12)

Ly/Lx	1.3	1.4	1.5	1.75
α_x	0.093	0.099	0.104	0.113
α_y	0.055	0.051	0.046	0.037

b. Design a Square RCC column to carry an axial service load of 1800KN .It is 4m long, effectively held in position and restrained against rotation at both ends. Use M20 concrete, Fe415 steel and LSM. (8)

Q.5 Attempt the following. **20**

a. Write step by step procedure to design isolated footing subjected to axial load and uniaxial moment. (4)

b. A rectangular beam of size 300 x 450 mm overall is reinforced with 4 bars of 20 mm φ as tension reinforcement. It is subjected to a service shear force of 40 kN and a service bending moment of 30 kN m. In addition to this it also carries a service torsional moment of 4 kN m. Design the beam for combined BM,SF and TM. Assume 50 mm as effective cover to the tension and compression reinforcement. Use M20 and Fe415 as grades of the materials. Use LSM. (8)

c. A RCC beam of size 300 x 550 mm effective depth is reinforced with 5 bars of 16mm dia. in tension zone. Determine moment of resistance using Ultimate load method in RCC. Use M20 concrete and Fe 415 grade steel as the materials. Also Draw Stress block across the section. (8)

Q.6 Design the combined footing for two columns C1of size 450x450 mm and C2 of size 600 x 600 mm in size and carrying 600 KN and 900 KN as working loads respectively. The columns are spaced at 3.8 m apart. The available width restriction is 2.5 m. The face of the smaller column is 0.4 m away from the property line. The SBC of the soil is 135 kN/m^2. Use M 25, Fe 415 and LSM . Sketch reinforcement details in longitudinal and transverse direction. Apply all necessary checks. **20**
