BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VI CIVIL : WINTER- 2022
SUBJECT : STRUCTURAL DESIGN-II

Day : Thursday | Time : 10:00 AM-02:00 PM

Date : 24-11-2022 | **W-13609-2022** | Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Use of I.S. 456-2000 and interaction charts and electronic non programmable **CALCULATOR** is allowed.
3) Figures to the right indicate **FULL** marks.
4) Draw neat labeled diagrams **WHEREVER** necessary.
5) Assume suitable data if necessary.

Q.1 **a)** Differentiate between Working Stress method and Limit State Method. **(05)**

b) Define Limit State and explain in short, the limit state of durability. **(05)**

OR

Q.1 **a)** Define Partial Safety factor. What is Partial safety factor for steel and concrete as per Is 456? Also define characteristics load. **(06)**

b) Elaborate Ultimate load method. **(04)**

Q.2 **a)** Define doubly reinforced beam. What is the role of compression steel in doubly reinforced beam? **(05)**

b) An RC section 230mm $\times$600mm overall depth and reinforced with 4 bars of 20mm diameter is used as a simply supported beam over an effective span of 5m. Determine the maximum uniformly distributed load the beam can carry safely. Use Fe 415 steel and M20 concrete. **(05)**

OR

Q.2 **a)** Describe stress block parameters. **(03)**

b) Calculate the moment of resistance by LSM for flanged beam section detailed as below (T- Beam) **(07)**

i) Width of rib = 300mm ii) Effective flange width = 1300 mm

iii) Thickness of flange = 120mm iv) Effective depth = 475mm

v) Tension steel = 2-20mm diameter through plus 2 #12 curtailed at mid span.

Use M20 grade of concrete and Fe 500 grade of steel.

Q.3 Determine the shear capacity of RC beam 300 $\times$550 mm (effective depth) reinforced with 4 bars -25 mm diameter as a tension reinforcement and 8mm diameter two legged stirrups @ 150mm/ cc throughout the beam, if (i) no bent up bars are provided and (ii) 2 bars are bent up. Use M20 and Fe 415 grade materials. **(10)**

OR

Q.3 Design continuous beam (AB = BC = CD = 4.5 m) for flexure and shear using IS code method for the following data: **(10)**

i) Dead load: 25 kN/ m ii) Live load: 15 kN/ m

iii) Material: M25 and Fe 415

Show the reinforcement details in L- section and cross-section at continuous supports and at mid-span.

Q.4 **a)** How the preliminary depth of slab is decided? What are the modification factors for the L/d ratio? **(06)**

b) Design a cantilever slab for effective span of 1.5m subjected to floor finish of 1.5kN/m^2 and live load 3kN/m^2. Use concrete of grade M20 and Fe 415 reinforcement. Draw details of reinforcement. Check for shear is not required. (Use LSM). **(04)**

P. T. O.

Q.4 Design a simply supported RCC slab over a room of size 3m × 7m. The thickness of supporting wall is 300mm. and the slab carries 75 mm lime concrete at its top, the unit weight of which is 20kN/m^3. The live load on slab may be taken as 2kN/ m^2. Use M20, Fe415 and LSM. Apply necessary design checks and draw neat sketches showing details reinforcement. **(10)**

Q.5 **a)** Explain in brief: P_u-M_u interaction diagrams. **(04)**

b) Design a square column to carry an axial load of 1500 kN. The unsupported length of column is 3.5m. Use M20 concrete and Fe 500 for reinforcement. Apply the checks for minimum eccentricity. **(06)**

OR

Q.5 Design an uniaxial square short column by limit state method with material M25 and Fe 415 to carry ultimate load of 800kN and working moment of 80kN.m about major axis bisecting the depth of column. The unsupported length of column is 3.6m. The column is fixed at one end and hinged at the other. **(10)**

Q.6 Design a uniform depth isolated footing for column section 230mm × 230 mm, carrying ultimate axial load of 500kN. Take safe bearing capacity of soil is 200kN/m^2. Show reinforcement details. Use M20 concrete and Fe415 steel. **(10)**

OR

Q.6 Design a footing for column section 300 × 600mm carrying axial load of 1400kN. The safe bearing capacity of soil is 225kN/m^2. Use M25 concrete and Fe500 steel. **(10)**

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