[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
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B. Tech 5th Semester Examination

Design of Concrete Structures-I (O.S.)

CE-5002

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one question each from Sections A, B, C and D. Section E is compulsory. All questions carry equal marks.

Use of IS: 456-2000 is allowed.

Use of SP: 16 is allowed.

SECTION - A

1. (a) On what factors does the permeability of concrete depend and why is it necessary to reduce the permeability of concrete in RCC construction? **(5)**

   (b) Discuss the importance of curing of concrete on durability characteristics of concrete. **(5)**

   (c) Describe the difference between working stress method and limit state method of design with stress strain behavior of materials. **(10)**

2. (a) Write a brief note on the corrosion of steel in RCC members and enumerate the precautions for reducing the corrosion of steel. **(5)**

   (b) Define characteristic strength and characteristic loads for design. **(5)**

(c) Enumerate the steps involved in the Indian Standard Method of Mix design of concrete. **(10)**

SECTION - B

3. (a) Using Limit state Method, find the moment of resistance of a singly reinforced beam 300 mm wide and 417 mm deep up to the center of the tensile reinforcement. The overall depth of the beam is 450 mm. The beam is reinforced with 3 bars of 16 mm diameter. The concrete used is M20 Grade and steel used is Fe 415 grade. **(10)**

(b) Using Limit State Philosophy design a beam over a span of 5 m (Effective) to support an all inclusive uniformly distributed load of 30 kN/m. Use M20 grade of concrete and Fe 415 grade of steel. Also check for shear and deflection. **(10)**

4. An isolated T-beam having 6 m span is acted upon by a moment of 150 kN-m. The width and thickness of flange are 1000 mm and 100 mm respectively. The overall depth is 600 mm and effective depth to the center of reinforcement is 520mm. The beam is reinforced with tensile reinforcement consisting of 6 Nos. 28 mm diameter bars. Compute the maximum stresses in steel and concrete. Use M 15 and Fe 415 steel. **(20)**

SECTION - C

5. (a) Explain with derivation how span to depth ratio can be used to control deflections in the beam. **(10)**

(b) A simply supported beam is 6 m and carries a characteristic load of 60 kN/m. If 6 no. of 20 mm diameter bars are provided at centre of span and 4 no. of these bars are continued into supports, check the development at supports assuming M 20 grade concrete and Fe 415 steel. **(10)**

6. Design a roof slab for a room 5.5 m x 6.6 m clear in size to support a superimposed service load of 5.2 kN/m^2, if one long edge is discontinuous and all others are continuous, using M-20 grade of concrete and Fe 415 grade of steel, for provide fire resistance for 2 hrs. **(20)**

SECTION - D

7. Design by limit state philosophy a RCC short column under biaxial bending with following data:

   Size of column 500mm x 300mm

   Factored load = 2000 kN

   Factored moment, Mux= 120kNm, Muy= 110 kNm

   Effective length along x-direction= 5.5 m

   Effective length along y-direction = 4.5 m

   Unsupported length of column = 7 m

   Use M 20 and Fe 415 **(20)**

8. Design the stem of a R.C. cantilever retaining wall supporting an earth embankment 4.5 m high, the top surface of which is horizontal. The depth of foundation below ground level is 1 m. Unit wt. of earth = 17kN/m^3, angle of internal friction = 40°, Allowable bearing capacity on ground = 160 kN/m^2. Use M20 grade of concrete and Fe 415 grade of steel. Also check the stability of retaining wall. **(20)**

SECTION - E

9. (a) What is the difference between Design Mix Concrete and Nominal Mix Concrete?

   (b) What is the difference between shrinkage and creep?

   (c) What are different loads and load combinations used in the design of RCC structures?

[P.T.O.]

(d) What is the difference in working stress and limit state method of design?

(e) What is development length and what is its significance?

(f) Why is curtailment of reinforcement done?

(g) What is the bending stress in concrete in working stress method and in Limit state method of design?

(h) How is the deflection related with the limited span to depth ratio?

(i) In the design of the footings what is the maximum eccentricity of loads allowed?

(j) What is the structural difference between cantilever and counter fort retaining wall? **(10×2=20)**