PAPER ID-411148

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B.TECH
(SEM-V) THEORY EXAMINATION 2021-22
DESIGN OF CONCRETE STRUCTURES – I

Time: 3 Hours   *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.**   **2 x 10 = 20**
   a. Define modular ratio.
   b. List properties of concrete.
   c. Write down limitations of working stress method.
   d. What do you mean by ultimate limiting condition?
   e. Write down modular ratio of M20 and M15 grade of concrete.
   f. Why do we consider enhanced shear strength of concrete ?
   g. What is meant by "Design shear strength of concrete τc" ?
   h. Define effective depth in beam section.
   i. What is meant by shear lag in T beam?
   j. What is critical neutral axis?

SECTION B

2. **Attempt any *three* of the following:**   **10 x 3 = 30**
   a. Write a short note on testing of concrete.
   b. Write down the assumptions in limit state design method.
   c. Name and explain the three different failure modes of reinforced concrete beams under the combined effects of bending moment and shear force.
   d. Write the measures to control the deflection in slab.
   e. What is meant by segregations and bleeding of concrete?

SECTION C

3. **Attempt any *one* part of the following:**   **10 x 1 = 10**
   (a) Explain the properties of concrete.
   (b) Define
       (i) Working Stress Method
       (ii) Factor.of Safety
       (iii) Permissile Stress
       (iv) Design Loads in Working Stress Method

4. **Attempt any *one* part of the following:**   **10 x 1 = 10**
   (a) Why do we consider most of the beams as T or L-beams between the supports and rectangular beams over the support of continuous span? Derive expression of effective width for L and T beam.
   (b) Define nominal shear stress τv of rectangular and T-beams of (i) uniform depth and (ii) varying depth subjected to bending moment and shear force.

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5. **Attempt any *one* part of the following:** 10 x 1 = 10

(a) Determine the shear reinforcement for a reinforced concrete beam 30cm wide and 60cm deep for the following data.
Grade of concrete= M15, $f_v = 250$ N/mm^2 , Percentage of Tensile steel =0.8%, factored shear force, $V_u = 175$ KN

(b) What are the three different ways to provide shear reinforcement ? Explain the method of design of each of them.

6. **Attempt any *one* part of the following:** 10 x 1 = 10

(a) A hall in a building has a floor consisting of continuous slab cast monolithically with simply supported 230 mm wide beams spaced at 3.5m c/c. The clear span of the beam is 6m. Assuming the live load on slab as 3.0KN/m2 and partition plus load due to finishes as 1.5KN/m^2, design the slab with M25 grade concrete and Fe415 steel.

(b) What do you understand by serviceability limit states? Define cracking and vibrations in slab.

7. **Attempt any *one* part of the following:** 10 x 1 = 10

(a) A reinforced column of unsupported length 2.75m is to be designed for a factored axial load of 3200KN. Find the cross-sectional dimensions of the column and the reinforcement required. Use M20 concrete and take $f_v = 415$ N/mm^2.

(b) Design a reinforced concrete column which is 4.5 m long and fixed at both ends. It is carrying an axial load of 2000KN (service). Use M-25 concrete and Fe-415 steel.