

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2134

Roll No.

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**B.Tech.**

(SEM. V) ODD SEMESTER THEORY  
EXAMINATION 2012-13

**DESIGN OF CONCRETE STRUCTURES—I**

Time : 3 Hours

Total Marks : 100

- Note :-** (1) Attempt any **five** questions. Each question carries equal marks.  
(2) IS 456 -2000 is allowed. Assume any missing data suitably.

1. Attempt any **four** of the following : **(4×5=20)**
- Define characteristic strength of materials, concrete and steel.
  - Discuss the factors which affect workability of concrete.
  - Discuss the assumptions made in working stress method.
  - Write the expressions used for design constants in working stress method :
    - neutral axis constant
    - moment of resistance constant.Explain the terms used.
  - Write the name and apparatus used to determine the different physical properties of cement.
  - Discuss why doubly reinforced section of beam is required.

2. Attempt any **two** of the following : **(2×10=20)**

- (a) A singly reinforced beam section  $250 \times 550$  mm is reinforced in tension side with  $1256 \text{ mm}^2$  Fe 415 steel, with effective cover of 50 mm. Determine the uniformly distributed load it can carry if span of the beam is 5.5 m. Use M25 grade concrete.
- (b) Determine the reinforcement required in tension and compression side for a rectangular beam at midspan having a simply supported effective span of 4.5 m. The superimposed load is 40 kN/m and size of beam is limited to  $300 \text{ mm} \times 500 \text{ mm}$  overall. Assume suitable data for design.
- (c) A T beam RC floor system consists of 120 mm thick slab supported by beams at 3.5 m centers. Web width = 300 mm, effective depth of beam = 560 mm, tension reinforcement =  $2500 \text{ mm}^2$ , use M20 grade concrete and Fe415. Determine the moment of resistance of T beam if simply supported beam has span of 4.0 m. Assume neutral axis lies within the flange.

3. Attempt any **two** of the following : **(2×10=20)**

- (a) A RC beam is  $200 \text{ mm} \times 450$  mm effective depth and is reinforced with 6-20 mm Fe 415 grade bars at midspan and 3-20 mm bars are curtailed at support section. Determine the spacing of 8 mm two legged stirrups at support section for a factored shear force of 150 kN. Assume M 20 mix and TOR steel stirrups.



- (b) A R.C. beam section has cross section  $250 \text{ mm} \times 450 \text{ mm}$  and subjected to the following design forces (factored).  
Bending moment =  $150 \text{ kNm}$ , Shear force =  $70 \text{ kN}$ .  
Torsion Moment =  $40 \text{ kNm}$ . Determine the equivalent bending moment and shear force for which section is to be designed.
- (c) A beam of a multistorey building is reinforced with  $20 \text{ mm}$  dia Fe 415 bars in tension side. Calculate the lap length required. Use M25 grade concrete.

4. Attempt any **two** of the following : **(2×10=20)**

- (a) Discuss the Limit State of Serviceability. Also discuss the required checks in slab design.
- (b) Design a cantilever balcony slab projecting  $1.1 \text{ m}$  from a beam. Thickness of slab is  $175 \text{ mm}$  at beam support and gradually reduced to  $100 \text{ mm}$  at free end. Adopt  $LL = 3.0 \text{ kN/sqm}$ . Use M20 grade concrete and Fe 415.
- (c) Design an interior panel of a slab of size  $3.5 \text{ m} \times 5.0 \text{ m}$ . Slab is supported on  $250 \text{ mm}$  wide beam all around. Live load =  $5.0 \text{ kN/m}^2$  Finish =  $1.0 \text{ kN/m}^2$ , use M20 and Fe415.

5. Attempt any **two** of the following : **(2×10=20)**

- (a) Design a short circular column  $6 \text{ m}$  long to carry an axial load of  $250 \text{ kN}$ , if both ends of the column are fully restrained, use helical reinforcement.
- (b) Design a square column axially loaded to carry a load of  $400 \text{ kN}$  if its size is restricted to  $140 \text{ mm}$ . Use M20 and Fe415.
- (c) Discuss the design criteria of column subjected to combined axial and biaxial bending.