

(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 2010-11

DESIGN OF CONCRETE STRUCTURES—I

TCE502

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

PAPER ID : 0054

Roll No.

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(SEM. V) ODD SEMESTER THEORY
EXAMINATION 2010-11

CONCRETE STRUCTURE—I

Time : 3 Hours

Total Marks : 100

Note :— (1) Attempt **all** the questions.

(2) All questions carry equal marks.

(3) Use of IS-456 is allowed.

(4) Any data if missing, may be suitably assumed.

1. Attempt any **four** of the following :— **(5×4=20)**

(a) Describe various exposure conditions considered in the mix design of concrete.

(b) Enumerate various factors which influence compressive strength of concrete and explain any one.

- (c) Define and explain briefly :—
- (i) Target mean strength
 - (ii) Characteristic strength
 - (iii) Transformed section.
- (d) A rectangular beam is 300 mm wide and have 550 mm effective depth. It is reinforced with 4 bars of 14 mm diameter. Determine moment of resistance using working stress method of analysis. Use M-20 grade concrete and Fe-415 grade steel.
- (e) Determine area of compression and tension steel for a rectangular beam of 300 mm \times 500 mm effective depth by working stress method, if it is subjected to 95 kNm moment. Use M-20 concrete and Fe-415 steel.
- (f) Describe briefly properties of hardened concrete.
2. Attempt any **two** parts of the following :— (10 \times 2=20)
- (a) An isolated T-beam has 2.4 m wide and 120 mm thick flange. The effective width and depth of web are 300 mm and 580 mm respectively. The tension reinforcement consists of 8 bars of 20 mm diameter. The effective span of the simply supported T beam is 4.6 m. Determine the moment of resistance of the beam. The grade of concrete and steel are M-20 and Fe-415 respectively.
 - (b) A rectangular section of effective size 300 mm \times 500 mm is used as a simply supported beam of effective span 7 m. Determine maximum u.d.l. that can be applied on the beam, if maximum percentage of steel is provided

only on tension side. Use M-20 concrete and Fe-415 steel. Determine the amount of steel to be provided.

- (c) Design a cantilever beam of effective span 1.8 m. It is carrying a u.d.l. of 4 kN/m (service load). Use M-20 concrete and Fe-415 steel.

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

- (a) A 250 mm wide and 450 mm overall deep beam is reinforced with 3 nos. of 20 mm diameter bars of grade Fe-415 on tension side with an effective cover of 50 mm. Two legged 8 mm vertical stirrups are provided at 180 c/c. If one of the tensile bar is bent up at the section at 45°, determine the design shear strength of the section. Assume M-20 concrete has been used.
- (b) Design a rectangular beam section of 300 mm width and 500 mm effective depth subjected to ultimate moment of 60 kNm, ultimate shear force of 50 kN and torsional moment of 25 kNm. Consider concrete of grade M-20 and steel of grade Fe-415.
- (c) A simple supported beam of size 250 mm × 450 mm effective depth is reinforced with 3 bars of 20 mm diameter at bottom. It is subjected to ultimate shear force of 250 kN at the centre of support. Consider M-20 grade concrete and Fe-415 grade steel, determine the anchorage length of bars at simply supported end of beam.

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

- (a) Design an R.C.C. floor slab for a room having inside dimensions 4 m × 10 m and supported on all sides by

a 40 cm thick brick wall. The superimposed load may be taken as 3 kN/m^2 . Use M-20 mix and HYSD Fe-415 bars.

- (b) Design an R.C. slab for a room of inner dimensions $5 \text{ m} \times 6 \text{ m}$ size. It is supported all around with corners held down and carries live load inclusive of floor finish as 3000 N/m^2 . Use M-20 concrete and Fe-415 steel.
- (c) A rectangular simply supported beam of span 5 m is $300 \text{ mm} \times 650 \text{ mm}$ in cross section and is reinforced with 3 bars of 20 mm on tension side with an effective cover of 50 mm . Determine short term deflection due to an imposed service load of 20 kN/m excluding self weight. Use M-20 concrete and Fe-415 steel.

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

- (a) A circular column 4.6 m high is effectively held in position at both the ends and restrained against rotation at one end. Design the column to carry an axial load of 1150 kN if its diameter is restricted to 450 mm . Use M-20 mix and Fe-415 steel.
- (b) A short R.C.C. square column is to be designed to carry a factored load of 2400 kN . The reinforcement is restricted to 2% of gross area. Design the column using M-25 concrete and Fe-415 steel.
- (c) Column of a multistorey building is reinforced with 20 mm dia Fe-415 bars. Calculate the lap length required. Use M-25 grade concrete.