

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] MAY-JUNE 2016

Paper Code: ETCE 212

Subject: Design of Concrete Structures

Time : 3 Hours

Maximum Marks : 75

Note: Attempt any five questions including Q.No1 which is compulsory. Use of IS 456 is permitted.

Q1. Attempt **any five** parts:

(5x5=25)

- a) What is meant by sulphate attack on concrete? Which of the sulphate salts are most aggressive? How does one provide for conditions where the subsoil water has high sulphate content?
- b) Enumerate the five limit states commonly used in limit state design and state briefly how they are provided for in design.
- c) What is meant by characteristics strength of a material as used in IS456 (2000)?
- d) Draw the stress-strain curve for M20 concrete and Fe415 steel(a) as obtained in the laboratory (b) as assumed is IS456. How do you determine yield point of Fe415 steel in the laboratory.
- e) Explain how in most designs the depth of slabs or beams are taken larger than those obtained from bending moment considerations only. Does this produce an underreinforced, overreinforced or balanced section?
- f) Which theory would you use for analysis of stresses for the serviceability conditions of an R.C.C. beam?

- Q2. a) What is unsoundness of cement? Explain the testing procedure to determine the unsoundness of the cement. (3.5)
- b) What is grading of aggregate and its significance. (3)
- c) Determine the finess modulus of aggregate for the following result of sieve analysis. What does the result indicate? (6)

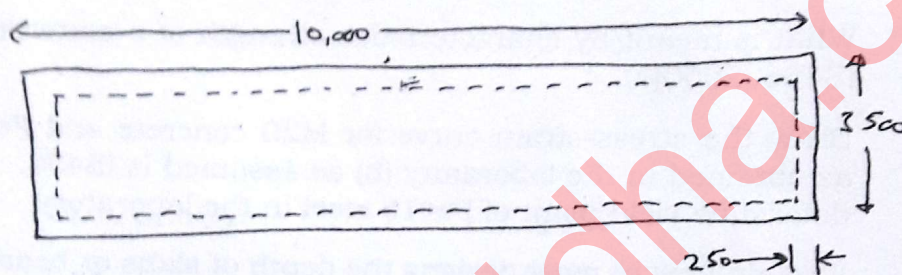
IS sieve size mm	10	4.75	2.36	1.18	0.6	0.3	0.15	0.075
% passing	100	92	74	55	23	12	9	7

- Q3. a) Compare working stress method and limit state method for design of structures in respect of strength and serviceability requirements. (4.5)
- b) A rectangular beam section of 300mm width and 500mm effective depth is reinforced with 5 bars of 20mm Φ , out of which 2 bars have been bent at 45°. Determine the shear resistance of the bent up bars and additional shear reinforcement required if it is subjected to ultimate shear force of 300kN. Consider concrete of grade M20 and steel of Grade Fe415. (8)

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- Q4. Design a rectangular beam section of 300mm width and 535 mm overall depth which is subjected to ultimate moments of (i) 150 kNm and (ii) 300kNm. Consider concrete of grade M20 and steel of grade Fe415. (12.5)
- Q5. Design a simply supported rectangular beam of clear span of 6m and subjected to a superimposed load of 50kN/m at service state. Consider support width of 30cm, concrete of grade M20 and steel of grade Fe415. (12.5)
- Q6. Design a simply supported one way slab as shown in Fig. It is subjected to live load of 4kN//m² and surface finish of 1kN/m². Consider concrete of grade M20 and steel of grade Fe415. (12.5)



- Q7. Design circular column section subjected to ultimate load of 2500 kN. Consider concrete of grade M25 and steel of grade Fe 415. (12.5)
- Q8. Design a reinforced concrete square footing for a column of section 400 mm x 400 mm which is subjected to a load of 1200 kN at services state. Consider,

Weight of soil, $W_e = 20 \text{ kN/m}^3$

Angle of repose, $\phi = 30^\circ$

Allowable bearing capacity of soil, $q_0 = 150 \text{ kN/m}^2$

Concrete of grade: M 20 and steel of grade: Fe 415

(12.5)
