Total No. of printed pages = 4

CE 181405

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Roll No. of candidate | | | | | | | | | | |

2024

B.Tech. 4th Semester End-Term Examination

CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY

New Regulation (w.e.f. 2017-18) &
New Syllabus (w.e.f. 2018-19)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

No IS codes are allowed in the Examination.

1. Answer the following : (10 × 1 = 10)

(i) If standard consistency of a cement sample is 31%, then the amount of water used for testing of setting time of 400 gm cement is

(a) 105.4 ml (b) 26.35 ml

(c) 111.6 ml (d) 124 ml

(ii) Compressive strength developed in concrete in 7 days is approximately

(a) 50% (b) 65%

(c) 90% (d) 95%

(iii) The relationship between Modulus of elasticity and compressive strength of concrete is

(a) $E=0.7\sqrt{f_{ck}}$ (b) $E=0.7 f_{ck}$

(c) $E=5000 f_{ck}$ (d) $E=5000\sqrt{f_{ck}}$

(iv) The Bogue compound responsible for initial setting and maximum heat of hydration is

(a) C_3S (b) C_2S

(c) C_3A (d) C_4AF

[Turn over

(v) The super-plasticizers are used as admixture for the following purpose

(a) To increase workability of concrete

(b) To disperse particle, remove air bubble and to retard setting

(c) To disperse particles only

(d) To decrease the setting time

(vi) The R-value of a thermal insulating material is

(a) Inversely proportional to the thickness of material

(b) Directly proportional to thermal conductivity of the material

(c) Equal to thermal conductivity of the material

(d) Inversely proportional to thermal conductivity of the material

(vii) Devel's attrition test is used to determine

(a) Aggregate abrasion value

(b) Aggregate crushing value

(c) Aggregate impact value

(d) Aggregate roughness value

(viii) Which of the following is added to steel to increase resistance to corrosion?

(a) Carbon (b) Copper

(c) Sulphur (d) Manganese

(ix) What is the main function of set retarders

(a) Improves workability at low w/c ratio

(b) Speeds up start of finishing operations

(c) Increase curing rate

(d) Decrease curing rate

(x) Ultrasonic testing is done to determine

(a) Yield strength

(b) Cracks below the surface

(c) Hardness

(d) Ultimate tensile strength

2. (a) Explain how an unsound coarse aggregate differs from a sound coarse aggregate. (5)

(b) Describe where aggregate impact test is carried out in civil engineering structures. (5)

(c) Describe one method of seasoning of timber. (5)

3. (a) The test results of sieve analysis for 20 mm single sized aggregate of a 3 kg test sample are given below. (5)

Sl. No	IS Sieve No	Wt. Retained (kg)
1	40 mm	0
2	20 mm	0.35
3	10 mm	2.38
4	4.75 mm	0.20

Determine whether the sample is conforming to IS 383-2016.

(b) Describe the advantages of air entraining agent. (5)

(c) Discuss the steps involved in concrete production. (5)

4. (a) What is C-S-H gel? How amount of C-S-H gel can be increased by adding fly ash or calcined clay? (8)

(b) What is creep and shrinkage of concrete? Mention the factors affecting shrinkage of concrete. (3+4)

5. (a) What are the external and internal factors that affect durability of concrete? Explain any one factor from each category. (3+2+2)

(b) State different methods of measuring workability of concrete. Describe the factors affecting workability. (2+6)

6. The following data are given for a concrete mix design : (15)

(a) Characteristic compressive strength required at the field after 28 days if curing = 25 N/mm2.

(b) Type of aggregate = Maximum nominal size 20 mm angular.

(c) Standard deviation to be used = 4.00

(d) Probability factor (k) = 1.65

(e) Value of X = 5.5

(f) Approximate air content 1%

(g) Workability required 200 mm of slump

(h) Exposure condition = Moderate

(i) Specific gravities of cement, coarse aggregate, fine aggregate and superplasticizer are 2.84, 2.61, 2.57 and 1.018 respectively.

(j) Grading zone for fine aggregate = Zone III

(k) Maximum water content per cubic meter of concrete for 20 mm aggregate is 186 kg.

(l) Volume of CA per unit volume of total aggregate, for FA zone III and nominal maximum size of 20 mm aggregate is 0.64.

(m) Minimun cement content from durability consideration 300 kg.

(n) Maximum cement content 450 kg

(o) Method of concrete placement = Pumping. Determine the actual quantities required for the mix at saturated surface dry (SSD) condition per cubic meter of concrete for W/C ratio of 0.45.

7. Write short notes (Any three) : (3 × 5 = 15)

(a) Fly ash bricks

(b) Light weight concrete

(c) Creep of concrete

(d) Curing of concrete.
