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M.Tech. (Structural Design) (2016 & Onwards) (Sem.–1) MATERIALS TECHNOLOGY Subject Code : MTSD-101

M.Code : 74242

Time : 2 Hrs. INSTRUCTIONS TO CANDIDATES : Max. Marks : 50

1.

Attempt any FIVE question(s), each question carries 10 marks.

- 1. a) Find gel/space ratio and theoretical strength of sample of concrete with 700gm of cement with 0.405 w/c ratio, on full hydration and at 6.5% hydration.
 - b) Explain the following types of cement highlighting how it is different from ordinary Portland cement in composition, properties and uses :
 - i) Low Heat Cement
 - ii) Sulphate Resisting Cement
 - iii) High Alumina Cement
 - iv) Air Entraining Cement
 - v) Hydrophobic Cement
- 2. a) Discuss the relation between modulus of elasticity and strength.
 - b) Define shrinkage and types of shrinkage.
 - c) Write about dynamic modulus of elasticity.
- 3. a) Explain the types and role of fibers in concrete. Explain simplified theory of fiber reinforced concrete under uniaxial tension.
 - b) Explain in brief the hydration of cement.
 - c) What is high density concrete? What are the materials used for its manufacturing?
- 4. a) Design a M40 concrete mix using IS method of Mix Design for the following data :

Maximum size of aggregate	= 20mm (Angular).
Degree of workability	= 0.90 compaction factor.
Quality control	= good
Type of exposure	= severe

Specific Gravity :	
i) Cement	= 3.15
ii) Sand	= 2.68
iii) Coarse aggregate	= 2.71
Water absorption :	
i) Coarse aggregate	= 1.0%
ii) Fine aggregate	= 2.0%
Free surface moisture :	
i) Coarse aggregate	= Nil
ii) Fine aggregate	= 2.0%
Sand confirms to zone III grading.	

Assume any other data required suitably.

- b) Discuss permeability of concrete.
- 5. a) What are the various types of chemical attacks encountered by concrete? Briefly explain each of them in four or five sentences.
 - b) What are various factors affecting fatigue strength of concrete?
- 6. a) Explain the terms mean strength, variance SD and coefficient of variance.
 - b) In a project a series of tests were conducted for M30 grade concrete used in the construction. Apply the acceptance criteria of 456-2000 to the following sample result (each sample represents the average strength of 3 specimens tested at 28 days) :

30.70, 29.23, 30.47, 26.57, 31.27, 35.40 MPa

c) Explain the significance of quality control.

- 7. a) Comment on deformation of crystals and theory of dislocations.
 - b) Enumerate tests on fresh concrete Discuss two of them.
 - c) What is the difference between fatigue and static fatigue?
- 8. a) Explain the various factors affecting shrinkage of concrete.
 - b) How does strength of concrete influence the modulus of elasticityand Poisson's ratio of concrete?

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