

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

FIRST SEMESTER 2022 – 2023

Civil Engineering Materials (Mid Semester Examination- Closed Book)

Course No: CE F230

Date: 02-11-2022 (Wednesday)

Duration: 90 mins. (2:00-3:30 PM)

Max. Marks: 50

Instruction: Answer the questions in the same sequence as in the question paper.

1. What is the difference between entrapped air and entrained air? [2]
2. How can restraint of movement of a member lead to shrinkage cracking? [2]
3. Why do we need indirect methods to test tensile strength of concrete? [2]
4. Determine the volume of water added from 7.2 litres of superplasticizer per m³ of concrete to achieve a slump of 100 mm. Specific gravity of superplasticizer is 1.15 and solid content is 32%. [2]
5. Mention any three advantages and disadvantages of concrete as a construction material. [3]
6. What do you understand by the term curing of concrete? What is the significance of curing? [3]
7. What is the maturity concept and what are its applications? [3]
8. The maximum practical level of cement replacement with GGBS is around 65% while with class F fly ash is around 20%. What is the reason for this difference? [3]
9. Coarse aggregate is placed in a rigid bucket and rodded with a tamping rod to determine its unit weight. The following data is obtained: Volume of bucket = 10 litres, Weight of empty bucket = 11 kg, Weight of bucket filled with dry rodded coarse aggregate = 28.4 kg. (a) Calculate the dry-rodded unit weight. If the oven-dried bulk specific gravity of aggregate is 2.65, calculate % voids in the aggregate. [3]
10. 3 sieves (19mm, 9.5mm, 4.75mm) were used for sieve analysis of coarse aggregates and the cumulative % passing was (80%, 30%, and 0%) respectively. Determine the fineness modulus of the coarse aggregates. [3]
11. For a given concrete mix proportion, explain why does a standard concrete cube shows higher strength than a standard concrete cylinder? [4]
12. What is (a) pozzolanic material (b) pozzolanic reaction (c) ITZ? What effect pozzolan addition has on ITZ? [4]
13. (a) A 2000 g sample of coarse aggregate in the SSD condition weighted 1280 g when immersed in water. Calculate the bulk specific gravity (SSD) of the aggregate. [1]
(b) A 2000 g sample from the stockpile of the same aggregate as in part (a) weighted 1250 g when immersed in water. Calculate the moisture content of the aggregate in the stockpile. [3]
14. Briefly explain the need of prestressing and how creep in concrete leads to loss of prestress [3+3].
15. Answer the following (3+3):
 - a. Determine the temperature rise in a mass concrete member after 28 days. The mix proportion of concrete is 1:1.5:3:0.6 (cement: FA: CA: water). Assume that the heat of hydration of cement after 7 and 28 days are 500 and 600 kJ/kg respectively; specific heat of water = 4.2 kJ/kg/°C; specific heat of cement, FA and CA = 0.20, 0.30, 0.40 times that of water respectively.
 - b. If we decide to replace 60% of cement with GGBS, what will be the rise in temperature after 7 days at the core and near the surface? Assume the following: Heat evolved by the hydration of GGBS after 7 days = 50 kJ/kg, specific heat of GGBS = 0.25 times that of water and 30% heat loss is expected near the surface due to lower ambient temperature.

***** Best wishes *****