

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, PILANI****First Semester 2023 – 2024****CE G534 (Pavement Material Characterization) Mid-Sem (Closed Book)****Instructor In-Charge : Dr. Nishant Bhargava****Max. Marks : 25****Duration : 90 minutes**

1. Fill in the blanks **[0.5] each**
  - a. Bitumen emulsion CSS-1h represents \_\_\_\_\_.
  - b. \_\_\_\_\_ test is used to determine the resistance of aggregates to degradation when exposed to weathering.
  - c. If the response of a viscoelastic material exhibits both \_\_\_\_\_ and \_\_\_\_\_ for all histories, such response is said to be linear.
  - d. For bitumen emulsion, \_\_\_\_\_ test is used to measure of the permanence of the dispersion of bitumen particles in water phase as related to time.
  - e. If the particle radius of bitumen in bitumen emulsion increases by 2 times, then the velocity of the downward movement of the particles increases by \_\_\_\_\_ times.
  - f. Temperature at which viscosities are similar, irrespective of bitumen grade is known as \_\_\_\_\_.
  - g. \_\_\_\_\_ is defined as the increase in stiffness or hardening of bitumen during production and in-service of pavement.
2. Determine the intermediate temperature for PG 52-22 grade binder. **[1]**
3. What is the maximum allowable bitumen temperature that could be used for emulsion production given that bitumen weight is 60% and soap solution weight is 40% by total weight of emulsion? Assume that the soap solution is heated to 50°C and the maximum allowable emulsion exit temperature is 95°C. **[1]**
4. List the different types of crushers used for aggregate production. Explain the working principal of one primary crusher and one secondary crusher. **[2]**
5. Explain the concept of temperature susceptibility of bitumen with the help of an illustration. What are the problems associated with highly temperature susceptible bitumen? **[2]**
6. What are the effects of compaction on soil properties? **[2]**
7. List the advantages of bitumen emulsion over cutback bitumen. **[2]**
8. What is the influence of SARA fractions on the properties of bitumen? **[2]**
9. Why the presence of plastic fines in the fine aggregate is detrimental to the bituminous mix? Briefly describe the test commonly used for determining the presence and amount of plastic fines **[3]**
10. Describe the 3 manual identification tests used for classification of fine-grained soils in field. **[3]**
11. Derive the constitutive relation for Kelvin-Voigt model. Derive and explain the creep and recovery behavior using stress-strain-time relations for Kelvin-Voigt model. **[3]**