

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

FIRST SEMESTER 2016-2017

PAVEMENT MATERIAL CHARACTERIZATION - Mid Semester Exam

Course No: CE G534

Date: 04-10-2016

Duration: 90 Mins (Closed book)

Max. Marks: 50

Part I [1 marks]

1. You went to Europe and a field Engineer told you that he is using an oxidized bitumen having grade 85/25. What do you understand by this grade?
2. Is rotational viscometer testing done on original binder?
3. Which chemical is specified by Indian specification for checking solubility of bitumen?
4. The limiting criteria for N_i and N_m in Superpave mix design process are.....
5. What are the aggregate property requirements for Superpave mix design?
6. The stress levels at which MSCR test is done are.....

Part II [2 marks]

1. What are the different sources of Binders?
2. What should be the maximum viscosity of binder at 135 °C? Why is it important?
3. Explain the composition of Emulsion. Typically, how much bitumen is present in an Emulsion?
4. Explain the tests done to measure the durability and soundness of aggregates.
5. What are the different types of forces applied during crushing of aggregates?
6. What is ageing of binder? How can be ageing simulated in laboratory?
7. Write down the equation proposed by Pfeiffer and Vandoormal. Why is it used?
8. List the different equipment's used in Superpave binder testing. At what temperature conditions are these used?
9. What is modification of Bitumen? What are the advantages of modified bitumen? List down 5 modified binders.
10. Define Penetration Index.

Part III [3 marks]

1. You went to an oil refinery and saw the distillation process for obtaining paving bitumen. Illustrate the whole process through appropriate flow chart. It is encouraged that you mention appropriate temperature ranges and pressure adopted for each process.
2. What is grade bumping? Why is it done? What do you understand by PG 76-22?
3. What is breaking of Emulsion? What are the factors which control breaking time?

4. Why is $G^*/\sin\delta$ used as a parameter for rutting while $G^*\cdot\sin\delta$ for fatigue? Justify your answer with appropriate derivation.
5. Blend the three aggregates given below such that it meets the desired specification.

Sieve	% Passing			
	Aggregate 1	Aggregate 2	Aggregate 3	Design range
26.5	100	100	100	100
19	100	100	90	90-100
13.2	100	99	47	90 max
9.5				
4.75				
2.36	100	69	8	28-49
1.18				
0.6				
0.15				
0.075	28	0	0	2-8

6. Derive the expression for VMA and VTM.
7. Derive the expression for effective specific gravity of aggregates and asphalt absorption.
8. Briefly explain the steps involved in Marshall mix design.