BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

FIRST SEMESTER 2016-2017

PAVEMENT MATERIAL CHARACTERIZTION - End Semester Exam

Course No: CE G534 **Date: 05-12-2016**

Duration: 180 Mins (Closed book) **Max. Marks: 70**

Part 1 [1 marks]

1. The standard shear rate applied in a Rotational viscometer is ……..
2. Approximate viscosity at softening point for an asphalt binder is …….
3. Which equipment is used to remove the larger aggregate particles, before subjecting them into a primary crusher?
4. Bitumen absorption is calculated as a percentage of
   a) weight of mix b) weight of aggregates c) weight of coarse aggregates d) weight of fine aggregates
5. The most appropriate stabilizing technique for sands is …….

Part 2 [2 marks]

1. Match the following:

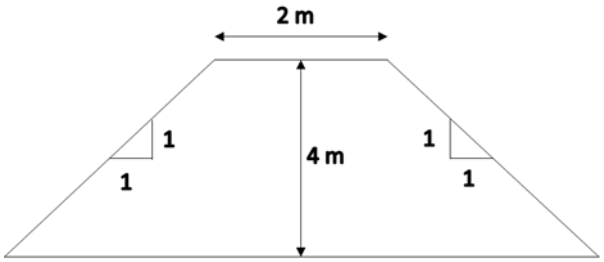
Basalt	
Schist	Igneous
Gneiss	Metamorphic
Shale	Sedimentary

2. Briefly explain residual and transported soils.
3. Differentiate briefly between Kaolinite and Montmorillonite clay minerals.
4. Briefly explain the design of cement stabilized soil as per British standard.
5. Differentiate between Haversine and Sinusoidal loadings. Using a suitable figure, explain load rise time and load period.

Part 3 [Long Questions]
(Attempt 'only' TWO out of question no. 1, 2 and 3)

1. Earth is required to be excavated from borrow pits for building an embankment. The wet unit weight of undisturbed soil is 18 kN/m^3 and its water content is 8%. In order to build a 4m high embankment with to width 2m and side slopes 1:1, estimate the quantity of earth

required to be excavated per meter length of embankment. The dry unit weight required in the embankment is 15kN/m^3 with a moisture content of 10%. Assume the specific gravity of solids to be 2.67. Also determine the void ratios and the degree of saturation of the soil in both the undisturbed and remolded states. **(15)**



2. A proctor compaction test was conducted on a soil sample, and the following observation were made:

Water content, percent	7.7	11.5	14.6	17.5	19.7	21.2
Mass of wet soil, g	1739	1919	2081	2033	1986	1948

If the volume of the mold used was 950 cm^3 and the specific gravity of soils grains was 2.65, make necessary calculations and draw, (i) compaction curve and (ii) 80% and 100% saturation lines**.** **(15)**

3. With suitable diagram explain the 'A' line for classification of soils. Briefly explain the effect of compaction on the engineering behavior (different parameters) of soil. Explain with suitable diagram and justification, the difference of compaction for cohesive and cohesion-less soil. **(5+5+5)**

4. Blend the aggregates A, B and C using Rothfutch method **(15)**

Sieve size (mm)	**Aggregates**			**Specifications**	**Median of Specifications**
	A	**B**	**C**		
25	100	100	100	94 to 100	97
12.5	63	100	100	70 to 85	78
4.75	19	100	100	40 to 55	48
2.36	8	93	100	30 to 42	36
0.6	5	55	100	20 to 30	25

0.15	3	36	97	12 to 22	17
0.075	2	3	88	5 to 11	8

5. Aggregates were sampled from contractors stockpile and sent to laboratory for preparation of mix design. The first sample was prepared using 4.5% binder content by weight of the mix. Theoretical maximum specific gravity (G_{mm}) of the sample was measured and the value was found to be 2.453. Later, the samples were prepared using 5% binder content. The weight in air, saturated surface dry (SSD) weight weight in water for samples prepared with 5% binder content were as follows:

   Weight in air = 1167.8 gms

   SSD weight = 1169 gms

   Weight in water = 650.7 gms

   Assuming the bulk specific gravity of the aggregates to be 2.252 and specific gravity of bitumen to be 1.02, calculate the following at 5% binder content:

   a) Bulk specific gravity of the mix.
   b) Voids in total mix
   c) Voids in mineral aggregates and,
   d) Voids filled with bitumen. **(10)**