(3 Hours) [Total Marks: 80]

Note
1. Question No **1 is compulsory**.
2. Attempt Any **4** out of remaining
3. Assume any suitable data wherever required.

Q.1

a. Briefly explain the functions of subgrade. **5**

b. Draw the 3 phase diagram for different Bituminous mixture. **5**

c. Classify the following soil as per PRA/HRB system **5**

Soil A	**Soil B**
Passing thro 0.075mm-34%	86%
L.L =38%	70%
P.L =26%	32%

d. How is the grading of aggregate will affect the performance of pavement? **5**

Q 2 a. Write short notes on side drains. **5**

b. The specific gravities and weight proportions for aggregate and bitumen are as under for the preparation of Marshall mix design. The volume and weight of one Marshall specimen was found to be 475 cc and 1100 gm.Assuming absorption of bitumen in aggregate is zero,find out Vv, Vb, VMA and V FB; **15**

Item	A1	A2	A3	A4	B
Wt (gm)	825	1200	325	150	100
Sp. Gr	2.63	2.51	2.46	2.43	1.05

Q.3 a. Enlist the test on Bitumen. Explain any one with specification **10**

b. Define the term soil stabilization. What are the broad categories of soil stabilization. **10**

TURN OVER

Q.4   **a.**   A longitudinal channel with trapezoidal cross section is to be constructed with a longitudinal slope of 1in 2500.type of soil is clay. The Mannings co-efficient is 0.024. The max allowable velocity is 0.6 m/s. Design the channel for a discharge of $3m^3$/sec .   **10**

   b.   Define compaction of soil. Briefly explain any one method of soil compaction.   **10**

Q.5   **a.**   A clay layer 4m thick has a final settlement of 6cm. The layer has double drainage if the co eff of consolidation is $0.02cm^2$/min. Determine the time required for different % of consolidation from 10% to 90%.   **15**

   b.   Calculate the % of passing filter materials based on permeability ratio and piping ratio. Drain pipe with circular perforated hole is 10mm dia. The Subgrade soil gradation is given in table   **05**

Sieve size(mm)	% passing
1.18	95
0.425	85
0.300	60
0.150	50
0.075	14
0.053	05

Q.6   **a.**   Explain various defects of highways due to improper drainage system.Also state the essential requirements of good highway drainage system.   **10**

   b.   Enlist and explain the factors affecting gravitational water.   **10**

_____