Time: 3 hours   Full Marks: 70

Answer any FIVE questions
Assume data reasonably, if required.

1. Define asset management. State the necessity of proper highway asset management explaining the relationship of asset performance and its age. Discuss on various performance measures of highway assets with example.   (4+5+5)

2. Write brief notes on   (4 x 3½)
   i) Various maintenance activities of highway assets
   ii) Pavement Management System
   iii) Technical perspective of Pavement Management System
   iv) Network level and Project level Pavement Management

3. a) 'An infinite slope is a concept rather than a reality'- Discuss.

   b) Show a typical failure surface in an infinite slope and explain the reasons for such a shape and location.

   c) Derive an expression for the factor of safely of an infinite slope subjected to seepage parallel to the slope surface.   (2x3+8)

4. a) In the slope stability analyses based on the limit equilibrium approach, how does it help to discretize the sliding mass into a number of slices?

   b) With a neat sketch show the complete system of forces on a typical slice. Determine whether the problem is statically determinate. If not, what is the degree of indeterminacy? How would you handle the indeterminacy to obtain a solution?

   c) Using the notation in (b) above, derive a general expression for the factor of safely common to all approximate methods. Is there any assumption involved here?   (2+2x6)

5. a) Starting from the common expression for factor of safely for all approximate methods, derive expression for factors of safely using.
   i) the Ordinary Method of Slices
   ii) the Bishop Simplified Method.

   b) Why are the above methods called 'approximate methods'? With reference to 'rigorous' methods how accurate are the above two methods?   (2x5+4)

6. a) What are the objectives of the soil-lime stabilization? How the approximate quantity of lime can be obtained for modification of clayey soil?

b) Explain the Triangular chart method for proportioning of materials for mechanical stabilization.

c) What are the factors influencing the properties of soil cement? Discuss the PCA method for designing soil-cement mix. (4+4+6)

7. (a) Discuss the scope of soil stabilization in road construction.

b) Explain the properties of soil-aggregates which affect the mechanical stabilized soil.

c) It is proposed to construct a sand clay road conforming to the following gradation specification:

IS Sieve	Percentage Gradation Limit	Sand Material (A)	Silt-clay Material (B)
4.75	100	100	-
2.36	80 -100	91	-
1.18	50 – 80	34	100
425μ	30 – 60	10	76
300μ	20 – 45	3	52
75μ	10 - 25	2	30

Gradation requirements indicate that a ratio 1:1 of the two materials would be adequate. LL of materials A and B are 25% and 38% respectively and PI of materials A and B are 2% and 11% respectively. What will be the LL and PI of the mixture? If the maximum LL and PI are the respectively 37 and 9, what should be the proportion of A and B in the mix? (2+2+10)