**R13**

**Time: 3 hours**                                                                                               **Max. Marks: 75**

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit.  Each question carries 10 marks and may have a, b, c as sub questions.

## PART - A

**(25 Marks)**

1.a)   List the various types of road patterns.                                                                   [2]
  b)   List the various requirements of Highway Ideal Alignment                                  [3]
  c)   List the various assumptions in the analysis of safe Overtaking Sight Distance.    [2]
  d)   Calculate the extra width required for a two lane highway having a horizontal curve of radius 200m,if the design speed is  80 Kmph.                                                          [3]
  e)   Draw a neat sketch of Condition and Collision diagram.                                       [2]
  f)   Define traffic volume and traffic density and speed.                                            [3]
  g)   List the factors to be considered in the design of intersection at grade.                [2]
  h)   List the various types of on street and off street parking facilities.                       [3]
  i)   List the various tests to be conducted to evaluate the strength properties of soils  [2]
  j)   Differentiate between Tack Coat and Prime Coat.                                               [3]

## PART - B

**(50 Marks)**

2.a)   Discuss in detail ,the various factors controlling the highway alignment with sketches.
  b)   What is the necessity of Realignment? List and explain the various steps in Realignment.                                                                                                             [5+5]
**OR**
3.a)   What are the various recommendations of Jayakar Committee? How were these implemented?
  b)   What are the various methods of classifying roads? Briefly outline the classification of urban roads.                                                                                                           [5+5]

4.a)   Explain PIEV Theory and the total reaction time of driver .
  b)   Calculate the length of transition curve using the following data:
Design speed =65 Kmph, Radius of circular curve = 220m, pavement width including extra widening = 7.5 m, allowable rate of introduction of super elevation (pavement is rotated about the centerline) is 1 in 150.                                                               [5+5]
**OR**
5.a)   With the help of a neat sketch, explain the attainment of super elevation in the field.
  b)   Calculate the length of vertical valley curve required between -1/30 and +1/25 grades for a speed of 80 Kmph to satisfy comfort and headlight sight distance requirements.
                                                                                                                                  [5+5]

6.a) Identify and explain by grouping the vehicular characteristics which affect the various elements of road design.

b) Spot speed studies were carried out at a certain stretch of a highway with mixed traffic flow and the consolidated data collected are given below.

Speed range, kmph   No of vehicles observed                                        [5+5]
0-10                12
10 – 20             18
20 - 30             68
30 - 40             89
40 - 50             204
50 - 60             255
60 - 70             119
70 - 80             43
80 - 90             33
90 – 100            9

**OR**

7.a) Write a note on various road user characteristics affecting the traffic.

b) Briefly explain the various objectives and methods of O and D studies.                [5+5]

8.a) Briefly explain the various design factors to be considered in the design of rotary.

b) With neat sketches, explain the Different types of traffic Islands and conflicts at Intersections.                                                                        [5+5]

**OR**

9.a) List and explain the various advantages and disadvantages of Rotary.

b) List the various advantages of at grade and Grade separated Intersections.           [5+5]

10.a) List the specifications, materials and construction steps for laying Bituminous concrete.

b) Explain briefly the importance and requirements of Highway Drainage.                  [5+5]

**OR**

11.a) Discuss the desirable properties of Coarse Aggregates. List the various laboratory test conducted to find these properties.

b) Explain how the soils are classified based on HRB soil classification system.          [5+5]

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