CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

Fifth Semester B.E. Degree Examination, July/August 2022
Highway Engineering

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1　a. Briefly explain the following:
　　　i)　Characteristic of road transport.
　　　ii)　Indian Road Congress.
　　　iii)　Central Road Research Institute. **(10 Marks)**
　b. Briefly explain the salient features of 3rd and 4th 20 year road development plans in India. **(10 Marks)**

OR

2　a. List the factors affecting the alignment. Briefly explain the engineering surveys for highway alignment. **(10 Marks)**
　b. Determine the length of different categories of roads in a state in India by the year 2001, using the third road development formula and the following data:
　　Total area of the state = 80,000 sq.km
　　Total number of towns as per 1981 census = 86
　　Overall road density aimed at = 82 km/100 sq. km area. **(10 Marks)**

Module-2

3　a. Define friction. List the factors affecting friction or skid resistance. **(05 Marks)**
　b. Define Camber. List and write neat sketches of different shapes of Camber. **(05 Marks)**
　c. Define superelevation. Derive an expression for superelevation with neat sketch. **(10 Marks)**

OR

4　a. Define transition curve and list the functions of transition curves in the horizontal alignment of highway. **(05 Marks)**
　b. Calculate the minimum sight distance required to avoid a head-on collision of two cars approaching from the opposite directions at 90 and 60kmph. Assume a reaction time of 2.5 seconds, coefficient of friction is 0.7 and a brake efficiency of 50 percent in both the cases. **(07 Marks)**
　c. The speeds of overtaking and over taken vehicles are 70 and 40kmph respectively on a two way traffic road. The average acceleration during overtaking may be assumed as $0.99 m/sec^2$.
　　　i)　Calculate safe overtaking sight distance.
　　　ii)　What is the minimum length of overtaking zone?
　　　iii)　Draw a neat sketch of the overtaking zone and show the positions of the sign posts. **(08 Marks)**

Module-3

5 a. Explain briefly the desirable properties of subgrade soil. (06 Marks)
   b. List the various properties of road aggregates and the tests to be conducted to find each property of aggregate. (06 Marks)
   c. What are the various tests carried out on Bitumen? Briefly mention the uses of each test. (08 Marks)

OR

6 a. Briefly outline the advantages and limitations of rigid pavement. (04 Marks)
   b. Draw a sketch of flexible pavement cross section and show the component parts. Enumerate the functions of each component of the pavement. (08 Marks)
   c. Explain ESWL with sketch. Briefly explain the graphical method of determination of ESWL for dual wheel assembly. (08 Marks)

Module-4

7 a. With a neat sketch, explain the method of determining the aggregate-bituminous mixes proportioning by Rothfuch's method. (10 Marks)
   b. What do you understand by wet-mix macadam? Briefly explain construction steps and quality control checks during the construction of WMM base course. (10 Marks)

OR

8 a. Explain the various steps in the construction of Dense Bituminous Macadam pavement. (10 Marks)
   b. Explain step by step, the procedure of Dry Lean Concrete sub base course. (10 Marks)

Module-5

9 a. What are the requirements of Highway Drainage system? (05 Marks)
   b. Briefly explain with neat sketches:
      i)   Lowering of water table
      ii) Control of seepage flow. (10 Marks)
   c. Briefly explain the procedure for design of filter material. (05 Marks)

OR

10 a. Calculate the annual cost of a stretch of highway from the following particulars:

Item	Total cost Rs. in lakhs	Estimated life, years	Rate of interest, %
Land	35	100	6
Earth work	40	40	8
Bridges, culvert and drainage	50	60	8
Pavement	100	15	10
Traffic signs and real appurtenances	15	5	10

The average cost of maintenance of the road is Rs.1.5 lakhs per year. (10 Marks)
   b. List the factors to be considered for evaluation of vehicle operation cost. (05 Marks)
   c. List the advantages of implementing road projects through public private partnership modes. (05 Marks)

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