CBCS SCHEME

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18CV56

# Fifth Semester B.E. Degree Examination, Dec.2024/Jan.2025
## Highway Engineering

Time: 3 hrs. Max. Marks: 100

**Note:** 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Assume the missing data, if any, suitably as per relevant code.*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

### Module-1

1 a. List the various modes of transportation. Explain the characteristics of road transport. **(06 Marks)**

b. Apply the 3rd Road development plan formulae and calculate the length of different categories of roads in a state in India by the year 2001, if the area of state is 3,68,000 $Km^2$. Number of towns as per 1981 census was 300. **(08 Marks)**

c. How the roads are classified based on location and function? Explain those. **(06 Marks)**

**OR**

2 a. What are the various factors affecting highway alignment? Explain obligatory points. With neat sketches. **(06 Marks)**

b. What do you understand about VISION 2021? Explain its salient features. **(06 Marks)**

c. There are three alternate proposals for a backward district shown below. Suggest the order of priority for phasing, based on the utility units of 0.5, 1, 2 for the three population ranges and productivity units of 1 and 5 per 1000 tonnes of agricultural and industrial products.

| Road Link | Length Km | No. of village served with population range | | | Productivity served in 1000 tonnes | |
|---|---|---|---|---|---|---|
| | | < 500 | 501-1000 | 1001-2000 | Agricultural | Industrial |
| A | 500 | 100 | 150 | 40 | 250 | 20 |
| B | 600 | 200 | 250 | 68 | 320 | 25 |
| C | 700 | 270 | 350 | 82 | 500 | 35 |

**(08 Marks)**

### Module-2

3 a. Explain PIEV theory with a neat sketch. **(06 Marks)**

b. List the various objectives of providing i) Camber ii) Extra widening of pavement at curves. **(06 Marks)**

c. Calculate the stopping sight distance for a vehicle moving on a highway with a speed of 100 Kmph on i) Level road ii) On a road having 1 in 100 gradient. **(08 Marks)**

**OR**

4 a. Enumerate various steps for practical design of super deviation considering mixed traffic. **(06 Marks)**

b. What are the various types of gradient? Explain with standards. **(06 Marks)**

c. The speeds of overtaking and overtaken vehicles are 70 and 40 Kmph respectively, on a two way traffic road. If the acceleration of the overtaking vehicle is 0.99 $m/sec^2$, then calculate the safe overtaking sight distance. **(08 Marks)**

## Module-3

5 a. How do you find CBR value in the laboratory? Explain the test procedure with a neat sketch. **(10 Marks)**

b. Calculate the ESWL of a dual wheel assembly carrying 2044 Kg each, for a pavement, having thickness values of 15, 20 and 25 cm. If centre to centre spacing between the two tyres = 270 mm and the clear gap between the walls of the tyres = 110 mm. **(10 Marks)**

**OR**

6 a. List the various properties of coarse aggregate and the tests conducted to find each property coarse aggregate. **(10 Marks)**

b. The following test data of a soil subgrade is given plot the data and determine the CBR value

| Penetration (mm) | 0 | 0.5 | 1.0 | 1.50 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 7.5 | 10.0 | 12.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Load (Kg) | 0 | 5 | 16.2 | 28.1 | 40 | 48.5 | 56.5 | 67.5 | 75.2 | 89.0 | 99.5 | 106.5 |

**(10 Marks)**

## Module-4

7 a. Explain the construction steps for cement concrete roads. **(06 Marks)**

b. Explain the functions of prime coat, tack coat and seal coat in bituminous road construction. **(06 Marks)**

c. Explain the proportioning of soil aggregate mixes by Rothfutch method. **(08 Marks)**

**OR**

8 a. Explain the specification of materials and the construction steps for WMM layer. **(06 Marks)**

b. Explain the various steps in Dense bituminous Macadam construction. **(06 Marks)**

c. Explain the construction procedure for WBM course. **(08 Marks)**

## Module-5

9 a. Explain the various methods of sub surface drainage, with neat sketches. **(06 Marks)**

b. List the objective of i) Surface drainage ii) Sub surface drainage **(06 Marks)**

c. Explain the significance and requirements of highway drainage system. **(08 Marks)**

**OR**

10 a. List the various highway user benefits. **(06 Marks)**

b. Explain the various factors on which motor vehicle operating cost depends. **(06 Marks)**

c. Determine the relative economics of two types of flexible pavements by annual cost method from the following data :

| Detail | Pavement Type A | Pavement Type B |
|---|---|---|
| Total cost per Km, Rs (lakhs) | 33.00 | 62.00 |
| Design life, in years | 5.00 | 12.00 |
| Annual rate of interest, % | 10.00 | 9.00 |
| Salvage value after design life, in Rs. Lakhs | 20.10 | 30.00 |
| Average annual maintenance cost, per Km, in lakhs | 4.00 | 2.00 |

**(08 Marks)**

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