



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

Highway Engineering

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.

Module-1

- List the various modes of transportation. Explain the characteristics of road transport. (06 Marks)
 - 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 Km². Number of towns as per 1981 census was 300. (08 Marks)
 - How the roads are classified based on location and function? Explain those. (06 Marks)

OR

- What are the various factors affecting highway alignment? Explain obligatory points. With neat sketches. (06 Marks)
 - What do you understand about VISION 2021? Explain its salient features. (06 Marks)
 - 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

- Explain PIEV theory with a neat sketch. (06 Marks)
 - List the various objectives of providing i) Camber ii) Extra widening of pavement at curves. (06 Marks)
 - Calculate the stopping sight distance for a vehicle moving on a highway with a speed of 100 Km/h on i) Level road ii) On a road having 1 in 100 gradient. (08 Marks)

OR

- Enumerate various steps for practical design of super deviation considering mixed traffic. (06 Marks)
 - What are the various types of gradient? Explain with standards. (06 Marks)
 - The speeds of overtaking and overtaken vehicles are 70 and 40 Km/h respectively, on a two way traffic road. If the acceleration of the overtaking vehicle is 0.99 m/sec², then calculate the safe overtaking sight distance. (08 Marks)

Module-3

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

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

- Explain the construction steps for cement concrete roads. (06 Marks)
 - Explain the functions of prime coat, tack coat and seal coat in bituminous road construction. (06 Marks)
 - Explain the proportioning of soil aggregate mixes by Rothfutch method. (08 Marks)

OR

- Explain the specification of materials and the construction steps for WMM layer. (06 Marks)
 - Explain the various steps in Dense bituminous Macadam construction. (06 Marks)
 - Explain the construction procedure for WBM course. (08 Marks)

Module-5

- Explain the various methods of sub surface drainage, with neat sketches. (06 Marks)
 - List the objective of i) Surface drainage ii) Sub surface drainage (06 Marks)
 - Explain the significance and requirements of highway drainage system. (08 Marks)

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- List the various highway user benefits. (06 Marks)
 - Explain the various factors on which motor vehicle operating cost depends. (06 Marks)
 - 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)
