



# CBCS SCHEME

18CV56

## Fifth Semester B.E. Degree Examination, June/July 2024 Highway Engineering

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. HRB/PRA soil classification table is allowed.

### Module-1

- 1 a. Explain the role of transportation in social and economic development of the country. (06 Marks)  
b. Explain the recommendations of Jayaker-Committee. List the implementation of Jayakar – Committee. (06 Marks)  
c. The area of a certain district in India is 82,000km<sup>2</sup> and here are 85 towns as per 1981 census. Determine the lengths of different categories of roads to be provided in third twenty year road development plan. [Density and road 82km/100km<sup>2</sup> area]. (08 Marks)

### OR

- 2 a. Draw a neat sketch :  
i) Radial or star and circular  
ii) Radial or star and grid pattern. (06 Marks)  
b. Explain with sketches the various factors controlling the alignment of roads. (08 Marks)  
c. There are five alternate proposals of road plans for a backward district. The details are given below. Utility units of 0.5, 1, 2, 4 and 8 for the live population ranges and 1 and 5 per 1000A of agricultural and industrial products served.

Proposal	Road length km	Number of town and villages served population					Productivity Agricultural	In 10001 Industrial
		< 2000	2001 – 5000	5001 – 10,000	10001 – 20000	>20,000		
P	500	100	150	40	20	3	150	20
Q	600	200	250	68	28	3	220	25
R	700	270	350	82	36	4	300	35
S	800	280	410	91	41	4	400	42
T	900	290	430	96	44	4	430	45

(06 Marks)

### Module-2

- 3 a. Define camber. What are the objects of camber? Discuss the factors on which the amount of camber to be provided depends. Specify the recommended ranges of camber for different types of pavement surfaces. (10 Marks)  
b. The speed of overtaking and overtaken vehicles are 70kmph and 40kmph respectively on a two – way traffic road. If the acceleration of overtaking vehicle is 0.99m/sec<sup>2</sup>.  
i) Calculate safe overtaking distance  
ii) Mention the minimum length of overtaking zone  
iii) Draw a neat sketch of the overtaking zone and show the positions of the sign posts. (10 Marks)

OR

- 4 a. Explain PIEV theory. (04 Marks)  
 b. Derive an equation for finding the super elevation required if the design co-efficient of lateral friction is 'f'. (10 Marks)  
 c. A vertical summit curve is formed at the intersection of two gradients, +3 and - 5.0%. Design the length of summit curve to provide a stopping sight distance for a design speed of 80kmph. Assume other data. (06 Marks)

**Module-3**

- 5 a. List and explain desirable properties of an aggregates to be used in pavement construction. (06 Marks)  
 b. List and explain desirable properties of subgrade soil. (06 Marks)  
 c. The properties of subgrade soil are given below passing 0.074mm sieve = 55%, LL = 50%, PL = 41%.  
 i) Classify the soil by revised PRA/HRB system.  
 ii) Discuss the suitability of the soil as a subgrade material. (08 Marks)

OR

- 6 a. Differentiate between Bitumen and Tar. (06 Marks)  
 b. With a neat sketch explain the ESWL in pavement design. (06 Marks)  
 c. A load penetration values DBR tests conducted on a specimen of a soil sample are given below. Determine the CBR value of soil, if 100 division of load represents 190kg and in calibration chart of providing ring.

Penetration of plunger in mm	Load Dial Readings (Divisions)
0	0
0.5	0.5
1.0	1.5
1.5	2.5
2.0	6.0
2.5	13
3.0	20
4.0	30
5.0	38
7.5	50
10.0	58
12.5	63

(08 Marks)

**Module-4**

- 7 a. Explain Rothfutch's method used in design of soil aggregate mix. (10 Marks)  
 b. Explain the construction steps for cement concrete pavement slab. (10 Marks)

OR

- 8 a. Explain the construction steps for water bound Macadam roads. (10 Marks)  
 b. Write short notes on the following :  
 i) Bituminous Macadam  
 ii) Prime coat  
 iii) Tack coat  
 iv) Bituminous concrete. (10 Marks)

**Module-5**

- 9 a. What are the requirements of highway drainage system? (04 Marks)  
b. Explain with sketch how the subsurface drainage system is provided to lower the water table and control seepage flow. (10 Marks)  
c. Briefly explain the types of cross-drainage structures. (06 Marks)

**OR**

- 10 a. Explain the various highway user benefits of highway improvements. (06 Marks)  
b. Describe the various methods of economic analysis of a highway. (04 Marks)  
c. Compare the annual costs of two types of pavement structures :  
i) WBM with thin bituminous surface at total cost of Rs. 2.2 lakhs per km, life of 5 years, interest at 10%, salvage value of Rs. 0.9 lakhs after 5 years. Annual average maintenance cost of Rs. 0.35 lakhs per km and  
ii) Bituminous macadam base and bituminous concrete surface, total cost of Rs. 4.2 lakhs life of 15 years interest at 8%, salvage value of 2 lakhs at the end of 15 years, annual average maintenance cost Rs. 0.25 lakhs per km. (10 Marks)

\*\*\*\*\*