



CBCS SCHEME

15CV63

Sixth Semester B.E. Degree Examination, Aug./Sept.2020 Highway Engineering

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. What are the important recommendations of Jayakar Committee? How were these helpful in road developments in India? (08 Marks)
- b. Four new road links A, B, C and D are to be constructed during a 5 year plan period. Suggest the order of priority for phasing the road construction programme based on maximum utility approach. Assume utility units of 0.5, 1.0 and 2 for the population ranges and 1 per 1000 tonnes, 500 tonnes and 100 tonnes of agricultural, raw material and industrial products respectively.

Road Link	Length km	No. of Villages served with population range			Productivity served, in tonnes		
		< 1000	1001 – 2000	> 2000	Agricultural	Raw Material	Industrial Products
A	25	20	15	25	8000	4000	1000
B	35	30	20	40	6000	1000	1600
C	40	50	20	60	4500	2000	3200
D	30	15	12	30	4000	6000	500

(08 Marks)

OR

- 2 a. With a neat sketch, explain the concept of star and grid patterns. (08 Marks)
- b. Determine the length of different categories of roads in a state in India by the year 2001 using the third road development plan formule and the given data:
Total area of the state = 4,30,000 sq.km
Total number of towns as per 1991 census = 550
Overall road density aimed at = 75km/100km². (08 Marks)

Module-2

- 3 a. Explain various steps to be followed in a new highway project. (08 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 of 0.7 and brake efficiency of 50 percent, in either case. (08 Marks)

OR

- 4 a. What is superelevation? Explain the steps for practical design of superelevation. (08 Marks)
- b. An ascending gradient of 1 in 100 meets a descending gradient of 1 in 120. A summit curve is to be designed for a speed of 80kmph so as to have an overtaking sight distance of 470m. (08 Marks)

Module-3

- 5 a. Explain briefly, how CBR value of given soil is determined. (08 Marks)
 b. Explain with a neat sketch, how the plate load test is conducted to determine the modulus of sub grade reaction of soil and for making correction for small plate size. (08 Marks)

OR

- 6 a. Explain the meaning of ESWL. How is it determined for a dual wheel assembly and what are its applications? (08 Marks)
 b. Calculate the warping stress at interior, edge and corner region in a 25cm thick concrete pavement with transverse joint at 11m interval and longitudinal joints at 3.6m interval. The modulus of subgrade reaction is 6.9kg/cm^3 . Assume temperature difference for day conditions to be 0.6°C per cm of slab thickness. Assume radius of loaded area as 15cm $C_x = 1.03$ and $C_y = 0.55$, $E = 3 \times 10^5\text{kg/cm}^2$, $\mu = 0.15$, $e = 10 \times 10^{-6}$ per $^\circ\text{C}$. (08 Marks)

Module-4

- 7 a. Explain the construction steps for Bituminous concrete surface course. (08 Marks)
 b. What do you understand by Wet-Mix Macadam? What are its advantages and disadvantages over Water Bound Macadam? (08 Marks)

OR

- 8 a. List the desirable properties and explain the specifications of material for WBM pavement. (08 Marks)
 b. Enumerate the construction steps for cement concrete pavements. (08 Marks)

Module-5

- 9 a. Explain with sketches how the subsurface drainage system is provided to lower the water table and control the seepage flow. (08 Marks)
 b. The maximum quantity of water expected in one of the open longitudinal drains on clayey soil is $0.9\text{m}^3/\text{sec}$. Design the cross section and longitudinal slope of trapezoidal drain assuming the bottom width of the trapezoidal section to be 1.0m and cross slope to be 1.0 vertical to 1.5 horizontal. The allowable velocity of flow in the drain is 1.2m/sec and Mannings roughness coefficient is 0.02. (08 Marks)

OR

- 10 a. Explain the various road user benefits of highway improvements. (08 Marks)
 b. 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	12.0	100	6
Earth Work	9.0	40	8
Bridge culverts	7.5	60	8
Pavement	14.0	15	10

The average cost of maintenance of the Road is Rs.1.5 lakhs per year. (08 Marks)

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