



**Fifth Semester B.E. Degree Examination, Jan./Feb. 2021**  
**Transportation Engineering - I**

Time: 3 hrs.

Max. Marks:100

- Note:1. Answer any FIVE full questions, selecting atleast TWO questions from each part.**  
**2. Missing data may be suitably assumed.**  
**3. Draw neat sketches, wherever necessary.**

**PART - A**

- 1
  - a. What are the different modes of Transportation? Mention the advantages and disadvantages of Road Transportation. (06 Marks)
  - b. Explain the role of these organization in the development of Transportation in India.  
 i) CRF    ii) IRC    iii) HRB    iv) NHDP. (08 Marks)
  - c. In a certain district of area 31,600 km<sup>2</sup>, there are 32 towns as per 1981 census. Determine the road length as per 3<sup>rd</sup> – 20 year Road plan. Assume road density as 82/100 km<sup>2</sup>. (06 Marks)
  
- 2
  - a. List and explain the different planning surveys required for Highways. (06 Marks)
  - b. Explain the factors affecting the alignment of road. (06 Marks)
  - c. Fix the priority for the following alternate three proposals, population and productivity units are given below :

Proposal	Road length km	Population Range			Productivity, 1000 T	
		< 2000	2001 - 5000	> 5000	Agri	Industrial
A	300	55	40	10	300	175
B	250	50	35	15	200	250
C	200	40	30	10	100	150
Population and Productivity Units		1	2	4	1.5	2.0

(08 Marks)

- 3
  - a. What are the objects of providing the following Cross – sectional elements of road?  
 i) Camber    ii) Carriage way width    iii) Median    iv) Shoulders. (08 Marks)
  - b. Explain the principle of Saturation system for determining the optimum road length for Highway planning. (06 Marks)
  - c. Calculate the Stopping Sight distance for a highway with 100 kmph design speed at grade as (2%). 2% Ascending and Descending grade. (06 Marks)
  
- 4
  - a. What is Over taking zone? Draw a neat sketch of overtaking zone and show the positions of sign posts. (06 Marks)
  - b. Explain the importance of Stopping Sight distance on highways. List the factors on which it depends. (06 Marks)
  - c. The speed of overtaking and overtaken vehicle are 80 kmph and 60 kmph respectively. If the acceleration of overtaking vehicle is 2.5 kmph/seconds, calculate the overtaking sight distance. What is the desirable length of overtaking zone? (08 Marks)

**PART – B**

- 5 a. Differentiate between Flexible and Rigid pavements. Draw the cross section of any one explaining the importance of each component of the pavement. (08 Marks)
- b. List the desirable properties of Bitumen and name the tests to be conducted on Bitumen. (06 Marks)
- c. Enumerate the desirable properties of Road aggregated. Indicate the tests to be conducted to assess these properties. (06 Marks)
- 6 a. What is ESWL? How it is determined for Dual Wheel assembly? Mention its application. (06 Marks)
- b. Explain the major steps in the design of flexible pavement by Revised CBR method using Cumulative Standard axles as per IRC – 37 – 2001. (08 Marks)
- c. Explain the following : i) Modulus of Subgrade ii) Temperature stresses. (06 Marks)
- 7 a. Enumerate the construction steps for WBM road construction. (06 Marks)
- b. What are the causes for structural deterioration of pavement? (04 Marks)
- c. Calculate the stresses at Edge, Interior and Corner regions of a C.C. Pavement , using Westergaard's approach for the following data :  
 Wheel load = 4100 kg ; E – value of CC =  $3 \times 10^5$  kg/cm<sup>2</sup> ;  
 Pavement thickness = 15cm ; Poisson's ratio = 0.15 ;  
 Modulus of subgrade reaction = 3kg/cm<sup>3</sup> ; Radius of contact area = 15cm. (10 Marks)
- 8 a. Explain with sketches, how the subsurface drainage system is provided to lower the water table and control the seepage flow. (06 Marks)
- b. Explain briefly the various factors affecting Vehicle Operation Cost (VOC). (06 Marks)
- c. Calculate the annual cost of a stretch of a highway for the following particulars :

Item	Total cost (Rs in Lakhs)	Estimated Life in years	Rate of Interest %
Land	12.00	100	6
Earth work	9.00	40	8
Bridge and Culverts	7.50	60	8
Pavement	14.00	15	10

The annual cost of maintenance of the road = Rs 2.50 Lakhs and

$$\text{Capital Recovery Factor} = \left[ \frac{i(1+i)^n}{(1+i)^n - 1} \right] \quad (08 \text{ Marks})$$

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