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10CV56

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 km², there are 32 towns as per 1981 census. Determine the road length as per 3rd – 20 year Road plan. Assume road density as 82/100 km². (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 = 3×10^5 kg/cm² ;
 Pavement thickness = 15cm ; Poisson's ratio = 0.15 ;
 Modulus of subgrade reaction = 3kg/cm³ ; 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

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