BACHELOR OF ENGINEERING (CIVIL ENGINEERING) EXAMINATION 2023

[Third Year; Second Semester] Transportation Engineering - I

Total Time: Three Hours

Full Marks 100 (Part I: 60 + Part II: 40)

Use a separate Answer-Script for each part

PART I (60 Marks)

Answer brief & to the point. Assume standard value for any parameter, if required

1. Briefly explain any three of the following

- 5 x 3
- a. Role of the following vehicular characteristics on geometric design of highways Length, Width, Height, Acceleration, Turning Ability
- b. The major recommendations of Jayakar Committee
- c. Difference in Capacity definition between HCM 1950 and HCM 1985
- d. Vision Characteristics of a road user in context with Traffic Engineering
- 2. Write short note on OR explain any three of the following:

5 x 3

- a. Cant deficiency and Cant excess
- b. Requirements of a good balast
- c. Factors influencing choice of railway gauge
- d. Sleeper Density and spacing
- 3. Calculate the superelevation and the maximum permissible speed for a 3° BG transitioned curve on a high-speed route with a maximum sanctioned speed of 100 km/h. The speed for calculating the equilibrium superelevation as decided by the chief engineer is 75 km/h and the booked speed of goods trains is 40 km/h. The permissible cant excess and cant deficiency may be considered as 75mm and 100mm respectively
- 4. A BG branch line track takes off as a contrary flexure through a 4° from a main line track of a 3° curvature. Due to the turnout, the maximum permissible speed on the branch line is 25 km/h. Calculate the negative superelevation to be provided on the branch line track and the maximum permissible speed on the main line track (when it takes off from a straight track)
- 5. The design flow, mean free speed and average vehicle length on a roadway are 2000 veh/hr, 60KmpH and 5.0m respectively. Determine the required number of lanes for the following cases
 - a. Under basic capacity condition

4

b. Under LoS C condition with design speed as 75% of mean free speed and maximum permissible flow capacity ratio of 0.3

Ref. No. Ex/CE/5/T/304/2023

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Part II (40 Marks)

Answer All in brief and to the point. Assume any reasonable data if required but not provided.

- 1 (a) Detail the Engineering Survey steps for highway locations/alignment. (3)
 - (b) Explain the five (5) factors on which minimum overtaking sight distance required for the safe overtaking manoeuver depends. (4)
 - (c) What are the special considerations for highway alignment that are to be considered for hilly areas? (3) Explain in brief.
- 2 (a) Using PIEV theory, derive the expression of SSD with all necessary assumptions including all the (4+2+1) parameters. What do you mean by OSD? Mention the instances where ISD is required.
 - (b) Calculate the minimum sight distance required to avoid a head-on collision of two cars approaching from opposite directions at 100 and 50 kmph in a slope with 5% gradient. Assume a reaction time 2.5 seconds and the coefficient of friction as 0.7. Compare the distance in rainy season when brake efficiency is reduced down to 50%.
- 3 (a) Mention different tests conducted on Bitumen before selecting it for application. Justify each test result toward the proper functioning of bituminous pavement. (5)
 - (b) Two Load-Penetration data are given below for CBR tests. Determine the CBR values of the samples if the proving ring reads 10 kN for the total 966 dial gauge divisions. Take the standard loads as 1370 kgf and 2055 kgf for 2.5 and 5.0 mm penetration, respectively.

			Penetration (mm)																								
	Sample	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	0'9	9.5	0'2	7.5	0.8	8.5	0.6	5.6	10.0	10.5	11.0	11.5	12.0	12.5
Proving Ring Dial Reading	7	0	0	0	0	0	0	4	81	38	89	106	146	178	218	797	326	8/8	458	498	8/5	632	869	732	022	800	822
		0	0	0	0	0	0	0	0	0	0	2	5	15	25	35	45	52	28	99	74	82	65	104	110	120	128