MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

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MANIPAL INSTITUTE OF TECHNOLOGY

III SEMESTER B. TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, JAN 2023

HIGHWAY ENGINEERING (CIE 2152)

(– – 2023)

TIME: 3 HRS. **MAX. MARKS: 50**

Note: 1. Answer all questions.

2. Any missing data may be suitably assumed.

Q. NO	QUESTION	MARKS	CO	BL
1A	List the factors that affects Over Taking Distance (OSD).	2	2	2
1B	With a neat sketch, derive the expression for Stopping Sight Distance (SSD).	3	2	2
1C	A radius of 250m has to be provided at a locality due to site restrictions on a NH on plain terrain. Design the super-elevation. Should there be restriction in speed? Assume design speed of 100kmph.	5	2	3
2A	Explain pay as you go method of highway finance.	2	5	2
2B	Describe floating car method of speed and delay study.	3	3	2
2C	Describe volume-capacity ratio and Level of Service (LOS) curve with a neat sketch.	5	3	3
3A	Define Equivalent Single Wheel Load (ESWL). Draw a neat sketch of overlapping of loads from the dual wheel in a layered pavement structure.	2	4	2
3B	With a neat sketch explain alligator cracking in flexible pavement and scaling of concrete in rigid pavement.	3	4	2
3C	Draw a neat sketch of flexible pavement and explain the functions of each layers.	5	4	3
4A	Give your opinion on: in long run rigid pavement is economical than flexible pavement.	2	4	1
4B	With a neat sketch explain the effect of daily and seasonal variation of temperature on rigid pavement.	3	4	2
4C	With a neat diagram explain the importance of Dowel bars and Tie bars in the rigid pavement.	5	4	2
5A	Define highway cost. Describe its components.	2	5	1
5B	Define Vehicle Operation Cost (VOC). Mention the factors on which VOC depends.	3	5	2

5C	Compare the annual costs of a 2-lane highway per km for two types of pavement structures:	**5**	**5**	**3**

Description	WBM with thin bituminous surface	WMM base with WBM binder course and bituminous concrete surface
Total cost	Rs.135 lakhs per km	Rs.220 lakhs per km
Life	5 years	15 years
Interest	10%	8%
Salvage value	Rs.20 lakhs after 5 years	Rs.55 lakhs after 15 years
Annual avg. maintenance cost per km	Rs.0.45 lakhs	Rs.0.90 lakhs