MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL (A constituent unit of MAHE, Manipal)

MANIPAL INSTITUTE OF TECHNOLOGY VI SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER (Regular) EXAMINATION, APRIL-MAY 2024 TRAFFIC SYSTEMS AND ENGINEERING (CIE 4070) (06 - 05 - 2024)

TIME: 3 HRS.

Note: 1. Answer all questions.

2. Any missing data may be suitably assumed.

Q.No.	QUESTION	MARK S	CO	BL
1A	Describe the objectives of speed and delay studies. And define the following: Spot speed Running speed Journey speed and	<u> </u>	1	2
	congestion delay.			
1B	Identify the conflict points and mark them on the figure below	4	2	5
1C	Discuss the assumptions made in Lighthill and Whitham's theory- based macroscopic analysis of traffic.	2	2	2
2A	A road consists of 4 lanes, 2 in each direction. The maximum capacity of 2 lanes in one direction is 1500 vehicles/hour. When vehicles are stationary in a jamming condition, the average length occupied by a vehicle is 5.25 m. During a period of observation, the actual volume of traffic in one direction is steady at the rate of 800 vehicles/hour. This flow is brought to a halt when a traffic signal turns red, and a queue develops. Estimate the time in seconds which elapses from the moment the signal turns red until the stationary queue reaches another intersection 100m from the signal. Assume a linear relationship between speed and concentration.	5	2	5
2B	Sketch and Illustrate at least 3 different layouts of T-intersections with traffic islands.	3	2	3
2C	Discuss the advantages and disadvantages of rotary intersections.	2	3	2

MAX. MARKS: 50

1

3A	A fixed time 2 phase signal is to be provided at an intersection having a North-South and an East-West road where only straight-ahead								5	3	6	
	traffic is permitted. The design hour flows from the various arms and								and			
	North South Fast West											
	Decise h			700		000		1200				
	Design n	our now (q) n		700	4		950	1200				
	Saturatio	n flow (s) in I	PCU/hr	2800 2400 3200 3500								
	Design the optimum cycle time and green times for the minimum overall delay. The inter-green time should be the minimum											
	necessary for efficient operation. The time lost per phase due to											
	starting delays can be assumed to be 2 seconds. The value of the											
	amber period is 2 seconds, and the red-amber period is 2 seconds. Sketch the timing diagram for each phase.								nds.			
3 B	Differentiate between on-street and off-street parking.									3	4	2
3 C	Discuss the following: a) Traffic capacity, b) Basic capacity, c)								, c)	2	4	2
44	It is observed that road accidents and type of road are inter-								ter-	5	5	4
-12 \$	dependent from the data provided below:									0	U	-
	Road type											
				NH	SH	MDR	х О	THER				
		Fatal		20	12	8	4					
	Accident severity	Grievous Ir	ijury	25	35	22	24	1				
		Minor Injury		12	10	30 42		2				
	Test whether there is any significant relationship between the								the			
<u>A</u> R	accident severity and the type of road using statistical methods.								ight	3	5	2
Ч	from the street lantern.							igin	5	5	4	
4 C	At an unco	ntrolled in	tersectio	on, the	ave	rage	rate o	of accid	lent	2	5	4
	occurrence is estimated as 25 per year. Estimate the probability of								y of			
5A	Explain the road lighting system provided in the tunnels.								5	5	2	
5B	The accident data pertaining to a metropolitan city for the years 1965								965	3	5	4
	and 1970 are given below. Test whether there is any significant								cant			
	Ye	Year			1965 1970							
	Accidents	Accidents		300		400						
	Vehicle-ki travel	ehicle-kilometre of 25			0 million 300 million							
5 C	For a street l	ighting syst	em, havi	ing the	follo	wing	condit	ions: St	reet	2	5	5
	width = 15 m; Mounting height = 7.5 m; Lamp size = 5000 lumen;								nen;			
	Luminaire type = II; Coefficient of utilization = 0.54 ; Maintenance factor = 0.85 . Evaluate the spacing between lighting units to produce											
	an average Lux = 7 .											