Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY/JUNE 2022

SUBJECT: **TRAFFIC SYSTEMS & ENGINEERING [CIE 4070]**

REVISED CREDIT SYSTEM

(_ / / 2022)

Time: 3 Hours Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions
- Missing data may be suitably assumed

Q.No		Marks	CO
1A.	Discuss the traffic speed - flow relation with a neat sketch.	3	1
1B.	On a 2.8 km long link of road, it was found that the demand is 1000 vehicles/hour, mean speed of the link is 12 km/hr and the free flow speed is 27 km/hr. Assuming that the average vehicle occupancy is 1.2 person/vehicle, calculate the congestion intensity in terms of total person hours of delay.	3	2
1C.	One lane of a 2-lane one-way carriageway is closed for repairs. The maximum mean free speed under conditions of low flow in the 2 - lane portion is 65 kmph. Under conditions of low flow, observations show that the maximum mean free speed in the bottleneck is also 65 kmph. The average space headway when vehicles are stationary is 12.5 m. The volume of traffic on the 2-lane road is 1800 veh/hour. Assuming that the speed – concentration relation is linear, find: i) The mean speed of traffic through the bottleneck caused by the closure of one lane ii) The mean speed of traffic in the congested conditions immediately on the approach to the bottleneck iii) The mean speed of traffic on the carriageway clear of the influence of the bottleneck iv) The rate at which the queue of the congested traffic entering the bottleneck grows.	4	2
2A.	Traffic flow in terms of number of vehicles in an urban section at the intersection of two highways in the design year are given below: **Approach** / **Left Turning** (Cars, Commercial, Scooters) / **Straight Ahead** (Cars, Commercial, Scooters) / **Right Turning** (Cars, Commercial, Scooters) N: 200, 50, 100 / 250, 100, 150 / 150, 50, 80 E: 180, 60, 80 / 220, 50, 120 / 200, 40, 120 S: 250, 80, 100 / 150, 50, 90 / 160, 70, 90 W: 220, 50, 120 / 180, 60, 100 / 250, 60, 100 The highways at present intersect at right angles and have a carriageway width of 15 m. The entry and exit width at rotary is 10 m. Design and draw a rotary intersection making suitable assumptions.	5	3,4
2B.	Draw a neat sketch of Q-K curve for a bottleneck situation when flow is greater than bottleneck.	3	2
2C.	Draw a neat sketch of a high type channelized Y intersection.	2	3

<table>
<tr><td>3A.</td><td>Explain regression method of accident analysis.</td><td>3</td><td>5</td></tr>
<tr><td>3B.</td><td>The Motor vehicle fuel consumption in a city is 6 million litres, there were 3514 motor vehicle fatalities, 365,599 motor vehicle injuries, 6,921,049 motor vehicle registrations and an estimated population of 19,290,238. Kilometre of travel per litre of fuel is 13 km/litre. Calculate registration death rate, population death rate and accident rate per vehicle km.</td><td>4</td><td>5</td></tr>
<tr><td>3C.</td><td>Discuss the data to be collected for motorist accident reports.</td><td>3</td><td>5</td></tr>
<tr><td>4A.</td><td>Explain with a neat sketch the following road markings:
i) Warning lines in longitudinal marking
ii) Hazardous location marking</td><td>3</td><td>5</td></tr>
<tr><td>4B.</td><td>Differentiate between fixed time and vehicle actuated signals.</td><td>2</td><td>3</td></tr>
<tr><td>4C.</td><td>A three-phase traffic signal is to be installed at a right-angled crossing of two city streets. The site is "average" and the approaches are 12 metres wide between kerbs. The approaches are straight and level and parking is prohibited on them. One of the phases is to be a "pedestrian only" phase occurring at the end of each cycle. Starting delay may be taken as 2 seconds. An "all-red" period of 4 seconds is to be provided after each vehicle phase to allow clearance of right turning vehicles left over in the crossing.
The design hour traffic volumes in PCU/hr are given in the following table
<table>
<tr><td>From</td><td colspan="3">N</td><td colspan="3">E</td><td colspan="3">S</td><td colspan="3">W</td></tr>
<tr><td>To</td><td>E</td><td>S</td><td>W</td><td>S</td><td>W</td><td>N</td><td>W</td><td>N</td><td>E</td><td>N</td><td>E</td><td>S</td></tr>
<tr><td>PCUs/Hr</td><td>40</td><td>800</td><td>80</td><td>80</td><td>500</td><td>52</td><td>60</td><td>660</td><td>60</td><td>70</td><td>680</td><td>60</td></tr>
</table>
Calculate the optimum cycle time for a fixed time installation. Sketch the phasing diagram for each phase and a diagram showing the timings for all three aspects for a complete cycle. Make suitable assumptions for Amber and pedestrian interval.</td><td>5</td><td>3,4</td></tr>
<tr><td>5A.</td><td>Explain the cosine law of illuminance</td><td>3</td><td>5</td></tr>
<tr><td>5B.</td><td>Discuss the effects of glare problem caused by the distribution of light from the lantern</td><td>4</td><td>5</td></tr>
<tr><td>5C.</td><td>Explain the threshold zone of lighting provided in tunnels</td><td>3</td><td>5</td></tr>
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