MANIPAL INSTITUTE OF TECHNOLOGY
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MANIPAL INSTITUTE OF TECHNOLOGY

SIXTH SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, MAY 2023

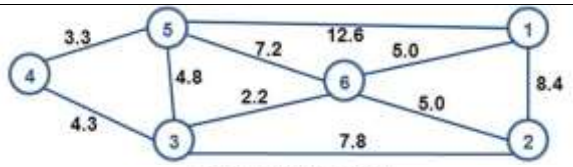
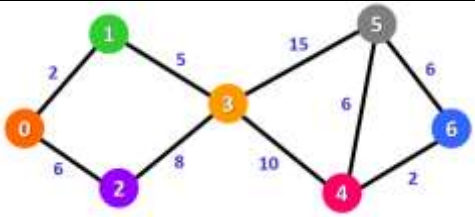
URBAN TRANSPORT PLANNING (CIE 4068)

(01 – 06 - 2023)

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

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.

<table>
<tr><th>Q. NO</th><th>QUESTION</th><th>MARKS</th><th>CO</th><th>BL</th></tr>
<tr><td>1A</td><td>
<table>
<tr><th>O/D</th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1</td><td></td><td>20</td><td>30</td><td>15</td></tr>
<tr><td>2</td><td>20</td><td></td><td>10</td><td>40</td></tr>
<tr><td>3</td><td>30</td><td>10</td><td></td><td>35</td></tr>
<tr><td>4</td><td>15</td><td>40</td><td>35</td><td></td></tr>
<tr><td>aj</td><td>65</td><td>70</td><td>75</td><td>90</td></tr>
<tr><td>Aj</td><td>130</td><td>140</td><td>225</td><td>90</td></tr>
</table>
Solve the target year trip distribution using Fratar method. Limit to one iteration and identify the interzonal volumes obtained after computation.
</td><td>5</td><td>3</td><td>3</td></tr>
<tr><td>1B</td><td>
A calibration study resulted in the following utility equation:
$U_k=a_k-0.025X_1-0.032X_2-0.015X_3-0.002X_4$
Where X_1 = access plus egress time, in min
X_2 = waiting time, in min
X_3 = line-haul time, in min
X_4 = out-of pocket-cost, in rupees
The trip distribution forecast for an interchange was a target-year volume of Q_{ij} = 5000 person trips per day. During the target year, trip makers on this interchange will have a choice between private automobile and local bus system. The target year service attributes of the two competing nodes are estimated to be:
<table>
<tr><td>Attribute</td><td>X_1</td><td>X_2</td><td>X_3</td><td>X_4</td></tr>
<tr><td>Automobile</td><td>5</td><td>0</td><td>20</td><td>100</td></tr>
<tr><td>Bus</td><td>10</td><td>15</td><td>40</td><td>50</td></tr>
</table>
</td><td>3</td><td>4</td><td>5</td></tr>
</table>

	Assume the mode specific constants to be 0 and -0.10 for auto and bus respectively. Apply the logit model to estimate the target year market share of the two modes.			
1C	List out the various characteristics influencing mode choice.	**2**	**4**	**1**
2A	Write a brief note on multiple linear regression analysis. Discuss the assumptions and drawbacks of this statistical method.	**5**	**2**	**2**
2B	 **Trips Between Zones** From/To 1 2 3 4 5 6 1 0 1000 1100 400 1000 1300 2 - 0 1050 700 1100 1200 3 - - 0 1200 1150 1600 4 - - - 0 800 400 5 - - - - 0 700 6 - - - - - 0 Six zonal centroids are connected as given in the figure. The travel times between each zone are also displayed on the links. The trip distribution between the six zones is given. Identify the minimum path from each zone to other zones. Use all-or-nothing assignment method to determine the total trips for each link after all of the trips from the following two-way trip table have been loaded onto the network.	**3**	**5**	**3**
2C	Explain capacity restraint trip assignment technique.	**2**	**5**	**2**
3A	 Analyze the trip assignment for all nodes for the above network using Dijkstra's algorithm.	**5**	**5**	**4**
3B	A freeway section 20 miles long has a free-flow speed of 70km/hr. Q_{max} = 3000 veh/hour, Q = 1500 veh/hour, τ = 0.15, α = 0.474, β = 4, T_0 = 17.14min. Apply the Davidson and BPR methods to find T_Q.	**3**	**5**	**3**
3C	Illustrate how the following factors affect trip generation and attraction rates. i) Land use characteristics ii) Income	**2**	**2**	**2**
4A	A transport planner recommends Lowry model to assess the following landuse-transport interaction problem for an urban area consisting of 4 traffic zones with the following details. Determine the total population and service employment population based on the given data. Employment available, e = [130 178 62 223] Basic employment, e^b = [110 140 50 190]	**5**	**4**	**5**

	Travel to home, $[a'_{ij}] = \begin{bmatrix} 0.4 & 0.25 & 0.2 & 0.15 \\ 0.25 & 0.4 & 0.15 & 0.2 \\ 0.15 & 0.10 & 0.35 & 0.4 \\ 0.15 & 0.25 & 0.25 & 0.35 \end{bmatrix}$ Journey to shop function, $[b'_{ij}] = \begin{bmatrix} 0.45 & 0.25 & 0.15 & 0.15 \\ 0.30 & 0.45 & 0.15 & 0.10 \\ 0.15 & 0.20 & 0.40 & 0.25 \\ 0.20 & 0.15 & 0.30 & 0.35 \end{bmatrix}$ Labour participation rate, $[a_j] = \begin{bmatrix} 0.70 & 0 & 0 & 0 \\ 0 & 0.70 & 0 & 0 \\ 0 & 0 & 0.70 & 0 \\ 0 & 0 & 0 & 0.70 \end{bmatrix}$ Service employment ratio, $[b_i] = \begin{bmatrix} 0.30 & 0 & 0 & 0 \\ 0 & 0.30 & 0 & 0 \\ 0 & 0 & 0.30 & 0 \\ 0 & 0 & 0 & 0.30 \end{bmatrix}$			
4B	Illustrate the major concerns while selecting a land use transport model.	**3**	**4**	**2**
4C	Distinguish aggregate and disaggregate models of trip generation.	**2**	**2**	**4**
5A	Explain category analysis. Summarize the assumptions and limitations of this method for determining trip generation.	**5**	**2**	**2**
5B	With the help of figures, briefly explain the diversion curves method for trip assignment.	**3**	**5**	**2**
5C	Given that the log-arc elasticity of demand is -0.28, identify the effect of an increase in transit fares from 50 to 80 cents given that the patronage prior to the price increase is 20,000 riders per day.	**2**	**4**	**3**