Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2025

Course: Transportation Engineering and Planning **Semester:** VI
Program: B.Tech Sustainability Engineering **Time:** 03 hrs
Course Code: SUEN3008 **Max. Marks:** 100

Instructions: Draw neat and clear figures wherever required. Assume suitable data if necessary.

SECTION A
(5Qx4M=20Marks)

S. No.	List of questions	Marks	CO
Q 1	**Define the following terms:** a. Shoulder b. Grade-separated intersections c. Expressways d. Time mean speed	**4 x 1**	**CO1**
Q 2	**Differentiate between the following:** a. Para-transit and rapid transit systems b. Flow and density of traffic stream	**2 + 2**	**CO1**
Q 3	List the advantages of a rotary intersection over signalized intersections.	**4**	**CO1**
Q 4	The free mean speed on a roadway is found to be 80 kmph. Under stopped condition, the average spacing between the vehicles is 6.9 m. Find the capacity of the roadway.	**4**	**CO2**
Q 5	Estimate the perception-reaction time for a vehicle travelling at 90 km/h, given the coefficient of longitudinal friction of 0.35 and the stopping sight distance of 170 m.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

S. No.	List of questions	Marks	CO
Q 6	Distinguish between sequential and non-sequential travel demand analysis techniques using their respective flowcharts.	**10**	**CO2**
Q 7	(a) Explain the role of trip generation models in the four-stage sequential travel demand analysis procedure. (b) Discuss the postulate of intervening opportunities model with mathematical notations.	**5 + 5**	**CO2**

Q 8	For the 1200 shopping trips from Zone A, three destinations Zones exist: X, Y and Z. The shopping areas available in each of the zones and their distances from Zone A are given in the below table. Assuming $v_A(j)$ = (0.5 x shopping area of Zone j in thousand sq. m) – (0.23 x distance to j in km), determine the trip distribution from Zone A using the destination choice model.	**10**	**CO3**

Zone	Shopping Area (sq m)	Distance from Zone A (km)
X	2000	7
Y	4000	12
Z	2000	4

Q 9	For designing a 2-phase fixed type signal at an intersection having North-South and East-West Road where only straight-ahead traffic is permitted, the following data is available.	**10**	**CO3**

	North	**South**	**East**	**West**
Flow (PCU/hr)	1000	700	900	550
Saturation flow	2500	2500	3000	3000

Total time lost per cycle is 12 seconds. Estimate the cycle length (seconds) as per Webster's approach.

OR

A car moving at a speed of 80 kmph has to overtake another car moving at a speed of 64 kmph in a two-lane one-way highway. If the reaction time of the driver is 2.5 s and acceleration of overtaking car is 0.95 m/s^2, calculate the safe overtaking sight distance.

SECTION-C
(2Qx20M=40 Marks)

Q 10	Assume that in your city (or town) it has been stated that the objective of the government is to reduce the congestion on the streets. Go through the steps of the rational transportation planning process and design a framework to develop the workable solution.	**20**	**CO4**

Q 11	Consider the following six-zone model of a town. Zones 1, 2, and 3 are fully residential areas and Zones 4, 5, and 6 are purely shopping areas. The shopping areas, the shopping trips attracted (per day), the shopping trips produced (per day), and the travel distances are presented in the below table. The cells which have a “-” imply that those data are irrelevant to the problem. Determine the trip distribution between the zones. Apply the origin-constrained gravity model, assuming $f(a_j)$ to be a linear function of the shopping area (in square metres) with a slope of 0.01 and constant term of 10. Also assume $h(d_{ij})$ to be d_{ij}^2 where d_{ij} is the distance in km.	**20**	

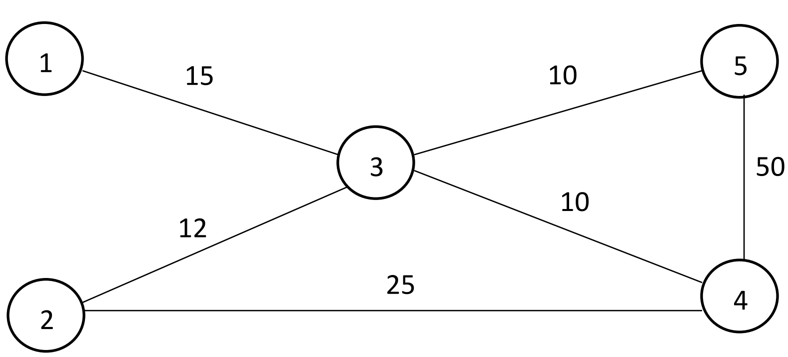
Zone	Shop area (m^2)	Trips produced	Trips attracted	Distance (km) to					
				1	2	3	4	5	6
1	-	1000	-	-	-	-	4	2	7
2	-	1000	-	-	-	-	3	1	6
3	-	2000	-	-	-	-	5	2	6
4	1000	-	800	4	3	5	-	-	-
5	2000	-	2000	2	1	2	-	-	-
6	3000	-	1200	7	6	6	-	-	-

OR

For the network shown in the below figure and trip-distribution matrix given in table below, apply the all-or-nothing assignment technique to determine the link flows. Note that the numbers on the links of the network denote the travel times and the numbers in the circles denote the zone numbers.

20

CO4



Origin Zone	Destination zone				
	1	**2**	**3**	**4**	**5**
1	0	0	200	100	150
2	0	0	300	300	50
3	200	300	0	100	100
4	100	300	100	0	0
5	150	50	100	0	0