MASTER OF ARCHITECTURE FIRST YEAR SECOND SEMESTER EXAM 2017

LAND USE & TRAFFIC SYSTEM

Time: 3 Hours | Full Marks: 100

Answer any **five** questions. All questions carry equal marks.

1. Define Land Use and Traffic system. Describe different types of urban forms with examples. What are the different types of urban structures? Briefly describe the theories and models of urban structure.

2. Write short notes on: (any two)
   a. Transportation survey
   b. Level of service
   c. Accessibility, personal accessibility and accessibility of a place

3. Establish the relationships between Flow - Density, Speed - Density and Speed - Flow.
   A section of highway is known to have a free-flow speed of 55mi/h and a capacity of 3300 veh/h. In a given hour, 2100 vehicles were counted at a specified point along this highway section. Estimate the space-mean speed of these 2100 vehicles applying the linear speed-density relationship.

4. Explain Hansen's accessibility model.
   A four zone city has the following characteristics

Table: 1

Zone	Total existing population	Holding capacity (acres)
1	3000	300
2	2000	280
3	9000	500
4	4000	300
Total	18000	600

Table: 2

From i \ To j	1	2	3	4
1	5	10	12	15
2	10	4	9	20
3	12	9	3	14
4	15	20	14	6

The travel times (in minutes) from one zone to other are given in table no. 2

An exponent of 2.2 can be assumed based on work done with other cities of the same size. If the population of this city is expected to rise to 24000 persons in 20 years, how will the population be distributed by zone? Assume that the total employment in each zone is proportional to the total existing population in that zone.

5. One transport company carries truckload of coal from 4 mines to four thermal power stations. The supply in truckloads and the demand in the truckloads together with the unit transportation costs per truckload (in Rs.1000) on the different routes are summarized in table no.3.

Table: 3

	D_1	D_2	D_3	D_4	Supply
M_1	11	20	22	18	14
M_2	15	18	14	23	12
M_3	32	10	18	36	10
M_4	21	16	25	13	14
Demand	8	10	14	18	

Determine the minimum cost of transportation for supplying the required demand of the four thermal power stations.

6. Briefly describe different techniques used for estimation of trip generation.
Given the following measurements of traffic speed 'u' and concentration 'k'. Apply the method of least squares to find the best fitting straight-line $u = a + bk$.

Table: 4

u	60	55	45	40	35	30	25
k	25	20	25	35	42	45	40

7. What are the advantages and disadvantages of using traffic signal in vehicular and pedestrian traffic?
A fixed time two-phase signal is to be provided at an intersection having a North-South and an East-West road where only straight-ahead traffic is permitted. The design hour flows from the various arms and the saturation flows for these arms are given in table no.5

Table: 5

	North	South	East	West
Design hour flow (q) in PCUs/hour	850	1000	500	600
Saturation flows(s) in PCUs/hour	3000	3000	2500	2500

Calculate 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. Sketch the timing diagram for each phase.

8. Describe the concept of Lowry model with the help of diagrams.
A study area is partitioned into 4 zones, which contains potential for housing and service employment as shown in table no. 6. Parameters relating to economic base concept are also specified in this table. For a future planning horizon, the amount of basic employment of 400 jobs has been determined and its spatial distribution allocates to zone 1 and zone 2. Given these data, the problem is to find the equilibrium location of residents and employments.

Table: 6

Variable Name	Notation	Zonal Values			
		1	2	3	4
Basic Employment	E_d^b	150	250	0	0
Housing opportunities	H_o	500	0	600	1000
Service floor space (in 1000 sq m)	F_d	0	2	0	1
Persons per worker	μ	3	3	3	3
Service workers per person	ν	0.2	0.2	0.2	0.2

The following inter-zonal travel time in minutes are given in table no. 7.

Table: 7

To / From	1	2	3	4
1	2	8	6	7
2	8	3	4	7
3	6	4	3	4
4	7	7	4	3

The residential locations are calculated from the following gravity model based on accessibility of workplaces to housing opportunities:

$$T_{do} = E_d \cdot \frac{H_o / t_{do}}{\sum_o H_o / t_{do}} .$$

Residential work trip ends are summed and multiplied by μ to give population R_o. The locations of service employment are calculated from the following gravity model based on accessibility of residences to service opportunities:

$$T_{od} = R_o . \nu . \frac{F_d / t_{do}^2}{\sum_d F_d / t_{do}^2} .$$

Show one iteration to assign populations to the 4 zones using Lowry model.
