Elective – I : Advanced Traffic Engineering

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Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data whenever necessary.
4. Diagrams should be given whenever necessary.
5. Illustrate your answers whenever necessary with the help of neat sketches.
6. Use of non programmable calculator is permitted.
7. Normal distribution chart & chi – squared test chart should be provided.

1. a) Explain in detail the various vehicular characteristics. How do they affect in design?   **6**

b) A passenger car weighing 2t is required to accelerate at the rate of 3 -2 m/sec^2 from a speed of 15 KMPH on a gradient of + 1.00% on a W.B.M. road surface. Assuming that the frontal area of the car is 2.1 m^2, calculate the engine H. P. needed for running speed of 40 KMPH. Take coefficient of rolling resistance (f) as 0-025, coefficient of air resistance (C_a) as 0-39.   **7**

OR

2. a) Explain in details the purposes of "Speed measurements".   **6**

b) Analyse the following 'spot speed' data and find   **7**

i) Lower and Upper speed limits.

ii) Medium speed.

iii) Design speed.

Speed Group (kmph)	Frequency
14 – 18.9	2
19 – 23.9	4
24 – 28.9	17
29 – 33.9	20
34 – 38.9	29
39 – 43.9	9
44 – 48.9	4
49 – 53.9	3

3. a) At an uncontrolled T junction past experience indicates that the probability of a vehicle arriving on a side road during a 10 second interval and turning right into the main road is 1/5. Find the probability that in a period of 1 minute, there will be 0, 1, 2, 3, 4, 5 or 6 vehicles arriving and turning right.   **6**

b) On a motor way, the numbers of vehicles arriving from one direction in successive 10 seconds interval was counted and recorded in table. **8**

Vehicles arriving in 10 sec intervals	Frequency
0	11
1	28
2	30
3	18
4	08
5	04
6	01
7 and more	0

Find out the mean rate of arrival and with the help of Poisson distribution compare the observed frequency with theoretical frequency.

OR

4. a) The spot speeds at a particular location are normally distributed with a mean of 52.8 KMPH and a standard deviation of 9.2 KMPH. What is the probability that, **6**
  i) The speed exceeds 60 KMPH.
  ii) The speed lies between 35 KMPH and 70 KMPH.
  iii) What is the 85th Percentile speed?

b) The following information was obtained from a transportation survey of a town : **8**

Traffic zone number	Population in the zone (thousands)	Total trips generated (in hundreds)
1	25	11
2	27	12
3	30	16
4	32	15
5	22	13
6	31	12
7	20	9
8	24	14

Develop a linear regression model for estimating trips generated from a zone. If the population in a particular zone increases to 50,000, predict the expected trip generation from that zone.

5. a) Design a rotary intersection for the following data of two highway situated in Urban area. The highway intersect at night angles and have a carriage way width of 15m. Make suitable assumption. **8**

Approach	Left Turning in PCU	Straight ahead in PCU	Right turning in PCU
N	404	530	406
E	410	620	360
S	440	430	490
W	520	320	400

b) Draw neat sketches of various types of grade separated intersections showing on it all the traffic movements. **5**

OR

6. a) Write in details the advantages & disadvantages of Rotary intersection. **7**

b) Explain in details DRIVEWAYS with neat sketch. **6**

7. a) What is signal co-ordination? Explain in brief various types of co-ordination systems used? **6**

b) The 15 minute traffic counts on cross roads 1 and 2 during peak hour are observed as 178 and 142 vehicles per lane respectively approaching the intersection in the direction of heavier traffic flow.
If the Amber times required are 3 and 2 seconds respectively for two Roads based on approach speeds, design the signal timings by trial cycle method. Assume an average time headway of 2.5 seconds during green phase. **8**

OR

8. a) Enlist various types of Traffic signs and write in general principles of traffic signing. **6**

b) A toll booth at the entrance to a bridge can handle 100 vehicles/hr. The vehicle arrival is 80 vehi/hr with a poissonial arrival pattern. Service time is exponentially distributed. Determine, **8**
i) Average number of vehicles in the system,
ii) The length of queue.
iii) Average time spend by the vehicle in the system.
iv) The average time spent by the vehicle in the queue.

9. a) Explain collision diagram with neat sketch. **6**

b) The accident data pertaining to a metropolitan city for the years 1985 and 1990 are as below: **7**

	1985	1990
Nos. of accidents	200	300
Vehicles km of travel	150	200
	million	million

Test whether there is any significant increase in the accident rates.

OR

10. a) What is condition diagrams? Draw and explain the application of this diagram. **6**

b) In an ordinary square junction of two roads there were 20 accidents in a year. After provision of traffic signals, the number of accidents dropped down to 8 per year. In the sector of the city where this junction is situated, the general trend observed was that number of accidents increased at a rate of 10 percent during the period covered by the above two observations. Test whether the improvement in junction design has a significant effect at 5% significance level. **7**

11. a) What are the various types of parking facilities designed for traffic needs? Compare on street parking with off street parking. **6**

b) Determine the number of parking stalls that can be accommodated in a curb length of 200 mts. (stall size 2.5 m x 5.0 m) if the angle of parking required is 30º degrees. Draw the layout for the above. **7**

OR

12. a) State various problems due to urban traffic and explain how these can be tackled in metro cities. **6**

b) Estimate the total parking demand in the commercial area having following floor area composition. **7**

    i) Officer – $5200 \, m^2$

    ii) Shops – $3640 \, m^2$

    iii) Restaurants – 370 seats

    iv) Cinema hall – 750 seats

    v) Twostar hotel – 54 rooms.

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