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10CV667

**Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017**

**Traffic Engineering**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting  
atleast TWO questions from each part.**

**PART – A**

1. a. Briefly discuss the scope of traffic engineering. (05 Marks)  
b. A car weighing 1300 kg and travelling at a speed of 65 kmph on a level road of rolling resistance coefficient 0.025, is allowed to coast by suddenly switching off the engine and putting the gear in neutral. If coefficient of air resistance is 0.37 and frontal area is  $1.65 \text{ m}^2$ , find the deceleration caused. In how much distance will the car come to a half? (08 Marks)  
c. Briefly explain the various road user characteristics and state how it affects driving conditions. (07 Marks)
2. a. Describe the different static characteristics of vehicles that affect road design and traffic performance. (08 Marks)  
b. A passenger car weighing 10 kN is required to accelerate at a rate of  $2 \text{ m/s}^2$  in the first gear from a speed of 10 kmph to 20 kmph. The gradient is +2 percent and the road has a WBM surface in good condition. Frontal projection of the area of car is  $2.15 \text{ m}^2$ . Car tyres have radius of 0.33m. The rear gear axle ratio is 3.82 : 1 and the first gear ratio is 2.78 : 1. Calculate the engine horse power needed and the speed of the engine. Make suitable assumptions. Coefficient of air resistance = 0.39, coefficient of rolling resistance 0.025. Tyre deformation factor = 0.945 ; transmission efficiency = 0.9. (08 Marks)  
c. Explain PIEV theory and its significance. (04 Marks)
3. a. From the following data, determine; i) model speed ii) speed limit for regulation iii) median speed iv) speed limit for traffic geometric design : (08 Marks)

Speed-group	No. of vehicles observed	Speed group	No. of vehicles observed
20.0 – 29.99	0	70.0 – 79.91	38
30.0 – 39.99	12	80.0 – 89.99	27
40.0 – 49.99	32	90.0 – 99.99	15
50.0 – 59.99	48		
60.0 – 69.99	60		

- b. With the help of neat sketches explain the different methods of presenting traffic volume data. (07 Marks)
- c. Define study area. What are the different factors that are to be considered while delineating the study area into zones? (05 Marks)
4. a. Define PCU. What are the different factors affecting PCU? List the IRC recommended values for different vehicles. (06 Marks)  
b. Two vehicles A and B approaching at right angles, A from West and B from South, collide with each other. After the collision, vehicle A skids in a direction 50° North of West and vehicle B, 60° East of North. The initial skid distances of the vehicles A and B are 38 m and 20m respectively before collision. The skid distances after collision are 15m and 36m respectively. If the weights of vehicles B and A are 6 and 4.4 tonnes, calculate the original speeds of the vehicles. The average skid resistance of the pavement is found to be 0.55. (08 Marks)  
c. Write short notes on the following : i) Derive line diagram ii) On-street parking iii) practical capacity. (06 Marks)

## PART – B

- 5 a. Explain the principle of i) car following theory ii) queuing theory. (06 Marks)  
 b. From Greenshield's theory derive the relationship between speed, flow and density. (07 Marks)  
 c. The speed and concentration of vehicles in a traffic stream were observed and the following data are obtained. Find the linear regression equation for determining the speed and concentration.

K(vph)	5	10	15	20	25	30	35	40	45	50
V(kmph)	72	68	61	52	47	39	32	27	20	13

(07 Marks)

- 6 a. The spot speeds at a particular location are normally distributed with a mean of 51.7 kmph and standard deviation of 8.3 kmph. What is the probability that : i) the speeds exceed 65 kmph ii) speeds lie between 40 kmph and 70 kmph iii) 85<sup>th</sup> percentile speed. The values from normal distribution tables are  $\phi(1.6) = 0.952$  ;  $\phi(2.21) = 0.9864$   $\phi(1.41) = 0.9207$  and  $\phi(z) = 0.85$  for which  $z = 1.04$ . (08 Marks)  
 b. Write a short note on traffic forecasting. (06 Marks)  
 c. The average arrival rate of vehicles at a stop controlled approach is 720 veh/hr. Assuming that arrival of vehicles is Poisson distributed, estimate the probabilities of having 0, 1, 2, 3, 4, 5 or more vehicles arriving over a 10 sec interval. (06 Marks)
- 7 a. A simple four leg intersection needs a fixed tune signal. The critical flow in N-S and E-W directions are 600 and 400 veh/hr, saturation flow is 1800 veh/hr, lost time/phase due to starting delays, is observed to be 2 seconds. Determine the cycle length and distributions of green. Give a neat sketch of timings. Use Webster's method. Take inter-green period = 4 sec and amber period = 2 sec. (08 Marks)  
 b. With the help of neat sketch explain elements of a traffic rotary. (07 Marks)  
 c. Explain the importance of ITS in traffic engineering. (05 Marks)
- 8 Write short notes on the following :  
 a. Moving car observer method  
 b. Vehicle actuated and synchronized signals  
 c. Chi-square test  
 d. Street lighting. (20 Marks)

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