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06CV667

Sixth Semester B.E. Degree Examination, May/June 2010
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. Explain briefly the physiological factors influencing traffic engineering. (05 Marks)
 - c. A passenger car, weighing 2500 kg, is required to accelerate at a rate of 3.5m/sec^2 in the first gear from a speed of 10 kmph to 20 kmph. The gradient is +1.2% and the road has a black topped surface, with a frictional co-efficient of 0.02. The frontal projectional area of the car is 2.5m^2 with $C_a = 0.37$. The car has tyres of radius 0.35m with a $\lambda = 0.935$. The rear axle gear ratio is 3.85 : 1 and first gear ratio of 2.98 : 1. Assume transmission efficiency of 0.9 and hence calculate engine horse power needed and speed of the engine in rpm. (10 Marks)

- 2
 - a. Discuss briefly the static and dynamic characteristics influencing the traffic. (06 Marks)
 - b. Define reaction time of a driver and hence explain the PIEV theory. (06 Marks)
 - c. In a road test for measuring the skid resistance using skid resistance equipment, the timer indicates 4.25 secs after the break application. Breaking distance was measured to be 32.3m before the vehicle was brought to halt. What is the average skid resistance of the surface? (08 Marks)

- 3
 - a. Explain the uses of i) spot speed studies ii) journey speed and delay studies. (05 Marks)
 - b. Explain the advantages of moving observer method. (05 Marks)
 - c. Grouping samples of speed, a sample is presented in the given table, in which, there are a total of 363 observations grouped into class intervals of 4kmph. Calculate i) Design speed ii) Upper speed limit iii) Lower speed limit iv) Medium speed limit v) Arithmetic mean speed vi) Standard deviation of speed and variance. (10 Marks)

Midpoint of speed kmph	28	32	36	40	44	48	52	56	60	64
No. of vehicles	9	74	79	75	66	33	17	6	1	3

- 4
 - a. Explain the objectives of O and D studies. (05 Marks)
 - b. Estimate the theoretical capacity of a lane, with one way traffic flow at a stream speed of 50 kmph. Assume average speed gap between the vehicles to follow a relationship $S_g = 0.278 Vt$ with a reaction time of 0.75 seconds. Assume the average length of the vehicle traveling is 6m and hence evaluate capacity for a two lane system. (05 Marks)
 - c. A vehicle of weight 30 tonnes skids through a distance equal to 50m, before colliding with another parked vehicle of weight 3 tonnes. After collision, both the vehicles skid through a distance equal to 16m, before stopping. Determine the speeds of vehicles assuming $f = 0.4$
 - i) After collision
 - ii) At collision
 - iii) Before collision.(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – B

- 5 a. Establish the relationship between speed, flow and concentration using Green shield theory. (06 Marks)
- b. A toll booth at the entrance to a bridge can handle 120VPH, the time to process a vehicle being exponentially distributed. The flow is 90 VPH with a Poission's arrival pattern. Determine i) Average number of vehicles in the system ii) Length of the queue iii) Average time spent by the vehicle in the system iv) Average time spent by the vehicle in the queue. (06 Marks)
- c. The speed and concentration of vehicle in a traffic stream were observed and the following data are obtained. Find the linear regression equation for determining the speed and concentration. (08 Marks)

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

- 6 a. Explain the significance of Chi – Square test in traffic engineering. (05 Mar)
- b. Explain the applications of simulation techniques in the context of traffic engineering. (05 Marks)
- c. The spot speeds at a particular location are normally distributed with a mean of 51.7 kph and a standard deviation of 8.3 kmph. What is the probability that i) The speeds exceed 65 kmph ii) Speeds lie between 40 kph and 70 kph iii) 85th percentile of speed. The values from normal distribution tables are $\phi(1.6) = 0.952$, $\phi(2.21) = 0.9864$, $\phi(1.41) = 0.9207$, $\phi(Z) = 0.85$ for which $Z = 1.04$. (10 Marks)
- 7 a. Explain the advantages and disadvantages of traffic signs. (05 Marks)
- b. Discuss briefly, fixed signal and vehicle actuated signals. (05 Marks)
- c. The average normal flow of traffic on cross roads A and B during design periods are 400 and 250 pcu/hr. The saturation flow values on these roads are estimated as 1250 and 1000 pcu/hr respectively. The all red time required for pedestrian carrying is 12 seconds. Design the two phase traffic signal by Webster approach and draw the phase diagram. (10 Marks)
- 8 a. Explain the necessity of an intelligent transport system in the present scenario. (06 Mar)
- b. Discuss briefly the importance of i) Street lighting ii) Road side arboriculture. (08 Marks)
- c. What is rotary? Explain the important design elements of a rotary with the help of relevant sketches. (06 Marks)
