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Q. P. Code : TE0822206-1   APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY   Name:......................

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M.Tech S2 (R,S) Exam June 2022   Reg. No:...................

SECOND SEMESTER M.TECH. DEGREE EXAMINATION JULY 2022

Branch: Civil Engineering   **Specialization: Transportation Engineering**

08CE6206 ADVANCED TRAFFIC ENGINEERING

Time:3 Hours   Max. Marks: 60

Answer all Six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q.No.	Module 1	Marks
1.a	Explain Greenberg's model with their advantages and disadvantages.	3
	Answer b or c	
b	Inspection of a freeway data set reveals a free flow speed of 60 mph, a jam density of 180 vehicles per mile per lane, and an observed maximum flow of 2000 vehicles per hour. Determine the linear equation for velocity for these conditions, and determine the speed and density at maximum flow conditions (Greenshield's model). How do the theoretical and observed conditions compare?	6
c	Based on fluid flow analogy approach, derive an expression for speed of traffic stream. State the assumptions and limitations of the approach.	6

Q. No.	Module 2	Marks
2.a	What do you mean by Internal distribution?	3
	Answer b or c	
b	Describe the salient features of the following distributions as applicable to the traffic engineering.	6

    i)   Negative exponential distribution
    ii)   Erlang distribution
    iii)   Log – Normal distribution

c	(i) The average number of accidents occurring monthly on an assembly shop floor is 2. The probability that there will be at least one accident in this month. (ii) It is estimated that the average number of events during a year is two. What is the probability of occurrence of not more than two events over three year duration? Assume that the number of events follow a Poisson distribution.	6

Q. No.	Module 3	Marks
3.a	Briefly explain (i) Local stability (ii) Asymptotic stability	3

Answer b or c

b	What is Car following model? Derive the velocity and position of a vehicle using linear car following models.	6
c	With the help of a neat sketch describe the various shock waves formed at a signalized intersection.	6

Q. No.	Module 4	Marks
4.a	Briefly explain queuing theory.	3

Answer b or c

b	Derive from fundamentals the expressions for various operating characteristics of an M/M/1 queuing system. State the assumptions made and the limitations due to them.	6
c	The exit from a parking garage is through a single gate. Vehicles arrive at a gate $\lambda=120$ veh/hr and the time to collect the fees is exponentially distributed with $1/\mu = 15$sec. Determine (i) the probability of an idle booth , (ii) the probability of 5 vehicles in the system , (iii) the length of non empty queue and (iv) the average time spent in the system.	6

Q. No.	Module 5	Marks
5.a	Define the terms Basic capacity, Possible capacity and Practical capacity and its importance in traffic engineering.	4

Answer b or c

b	Classify and discuss the effect of various factors that influence the capacity of a basic freeway section.	8

| c | Explain the various LOS as per HCM and what are the factors affecting the capacity and LOS. | 8 |

Q. No.	**Module 6**	**Marks**
6.a	Explain the different methods of generating random numbers in a computer.	4

Answer b or c

| b | Describe the different steps involved in simulating road traffic movements at an intersection through flowchart. | 8 |

| c | Passengers arrive at a ticketing centre every 4 ± 3 minutes. There are two counters each of which takes 8 ± 4 minutes to issue tickets. Passengers go to a vacant counter or join the shorter queue. Manually simulate the processing of 20 passengers and compute the parameters of operation. Generally the arrival and service are considered as uniformly distributed. | 8 |

Random Number Table

28	34	46	31	43
74	73	53	91	81
71	88	36	54	11
62	49	76	32	63