Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 711901N **Date: 11/02/2012**
Subject Name: Modeling, Analysis & Simulation
Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**		
	(i)	Define a mathematical model. How the mathematical models are classified.	**04**
	(ii)	Explain the following in detail $p(x) = nC_x p^x q^{n-x}; p(x) = \frac{x^m e^{-m}}{x!}$	**03**
	(b)		
	(i)	What is Digital Simulation?	**04**
	(ii)	Let x has the $f(x) = \begin{cases} \frac{x+2}{18}, if -2 < x < 4 \\ 0, otherwise \end{cases}$ .Find $E(X)$.	**03**
Q.2	**(a)**	From the basic property of moments of discrete distribution, find the variance of Poisson distribution.	**07**
	(b)	What is Monte-Carlo simulation and retrospective stimulation?	**07**
		OR	
	(b)	Rank in order of accuracy, the probabilistic the deterministic and the stochastic models. Briefly explain.	**07**
Q.3	**(a)**	Based on field observation it is found that the volume of traffic flow passing a point of highway segment is 720 vph. Calculate the probability that there is no vehicle passing this point in 5 seconds is in accordance with Poisson distribution. Also, calculate probability of exact 5 vehicles passing this point in 5 seconds and estimate the probability of less than 5 vehicles passing this point in 5 seconds.	**07**
	(b)	Given that the volume of a segment of roadway is 720 vph and traffic movement in accordance with the Poisson distribution. Calculate the (i) Probability of headway no less than 4 seconds and (ii) number of headways whose value is less than 4 seconds in an hour.	**07**
		OR	
Q.3	**(a)**	In the railway marshalling yard, goods trains arrive at a rate of 30 trains per day, Assuming that the inter arrival time follows an exponential distribution and a service time distribution is also exponential with an average of 36 minutes calculate(i)the mean line length (ii)the probability that the queue size exceeds 10.	**07**
	(b)	What is a random number? Write an algorithm on multiplicative congruential technique with the help of an example.	**07**

Q.4	**(a)**	The Traffic volume of roadways is 620 vph and its headway is distributed in the form of exponential equation .Estimate the number of the headways between 15 seconds and 20 seconds within two hours.	**07**
	(b)	A telephone exchange has two long distance operators. The telephone company finds that during the peak load, long distance call arrives in a Poisson fashion at an average rate of 15 per hour. The length of service on these calls is approximately exponential distributed with a mean length 5 minutes. (i)What is the probability that a subscriber will have to wait for his long distance call during the peak hours of the day? (ii)If the subscriber will wait and are serviced in turn, what is the expected waiting time?	**07**

OR

Q.4	**(a)**	"Continuous flow is the limiting behavior of discrete distribution" How?	**07**
	(b)	Which moments are useful in modeling and analysis and why?	**07**
Q.5	**(a)**	Based on the survey conducted at a busy bus stop in the past 10 year, it is found that the probability of each bus having a crash from 8:00am to 8:00pm is 2000.Estimate the probability of having no less than 2 crashes from 8:00am to 8:00pm at this stop.	**07**
	(b)	A petrol pump is supplied with petrol once a day. If its daily volume V of sales in thousands of liters is distributed by $f(x) = 5(1-x)^4, 0 \le x \le 1$.What must be the supply will be exhausted in a given day shall be 0.01?	**07**

OR

Q.5	**(a)**	Define 'entities' attributes and activities of a system with suitable examples.	**07**
	(b)	Give steps in simulating a queuing system with random arrivals at 3arrivals/hour and negative exponential service at 4 departures/hour? Give at least 5 arrivals and departures and hence tabulate the mean waiting time for the system.	**07**

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