Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. IST Semester–Remedial Examination – July- 2011

Subject code: 711305N

Subject Name: Statistics and Optimization

Date:12/07/2011 **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)** What is the difference between Binomial and Hyper geometric distribution? **07**

(b) What are the factors to be consider while designing questionnaire? **07**

Q.2 **(a)** Define Random number and probably distribution. Explain types of random variable with example. **07**

(b) In order to check the validity of the poissonian arrival in a lightly trafficked street free from the influence of inter sections or signal nearby. A count of vehicles passing an observer was taken. The number of vehicles arriving in intervals of 20 sec each was counted and recorded in the table below. **07**

No of veh. In 20 s interval	0	1	2	3	4	5	6	7	8	9	10	11	12
No of veh. Intervals with started no of veh.	-	4	13	23	26	24	14	20	6	2	3	3	1

Analyze the above data and fit a Poisson distribution function. Test the goodness-of fit by means of a χ^2 test and comment on the results.

OR

(b) Check whether following can be define probability distribution, if not justify it. **07**

(1) $f(x) = \frac{x}{15} \qquad x = 0,1,2,3$

(2) $f(x) = \frac{x-2}{2} \qquad x = 1,2,3,4$

Q.3 **(a)** What is Null hypotheses. Give guideline for selecting the null hypothesis. **07**

(b) A trucking firm is suspicious of the claim that the average lifetime of certain tires is at least 28,000 miles. To check the claim, the firm puts 40 of these tires on its trucks and gets a mean lifetime of 27,463 miles with a standard deviation of 1348 miles. What can it conclude if the probability of a type I error is to be at most 0.01? **07**

OR

Q.3 **(a)** Explain bayes' theorem with example. **07**

(b) Explain (M/M/1):(GD/N/α) Model of queueing Theory **07**

Q.4 **(a)** What is regression analysis? Write the assumption of the regression and its application in the transportation field. **07**

(b) A following are measurements of the air velocity and evaporation coefficient of burning fuel droplets in an impulse engine: **07**

Air Velocity (cm/sec)	Evaporation Coefficient (mm^2/sec)
20	0.18
60	0.37
100	0.35
140	0.78
180	0.56
220	0.75
260	1.18
300	1.36
340	1.17
380	1.65

Fit a straight line to these data by the method of least squares, and use it to estimate the evaporation coefficient of a droplet when the air velocity is 190 cm/s.

OR

Q.4 **(a)** Solve the following L.P. problem using Simplex method: **07**

Maximize $Z = 5X_1 + 3X_2 + 7X_3$

Subject to $X_1 + X_2 + 2X_3 \le 22$

$3X_1 + 2X_2 + X_3 \le 26$

$X_1 + X_2 + X_3 \le 18$

$X_1, X_2 \quad and \quad X_3 \ge 0$

(b) What are the uses of Assignment problem? Write mathematical formulation of Assignment problem. **07**

Q.5 **(a)** What is Transportation Problem? Write its Application. Explain types of transportation problem. **07**

(b) Determine an initial basic feasible solution of the following transportation problem using Least Cost Cell method. **07**

		Destination 1	2	3	4	Supply
Source	1	3	1	7	4	300
	2	2	6	5	9	400
	3	8	3	3	2	500
	Demand	250	350	400	200	1200

OR

Q.5 **(a)** Discuss the Application area of queuing theory. List and explain the terminology used in queuing system. **07**

(b) Vehicle passes through a toll gate at a rate of 90 per hour. The average time to pass through the gate is 36 seconds. The arrival rate and service rate follow Poisson distribution. There is a complaint that the vehicles wait for long duration. The authorities are willing to install one mere gate to reduce the average time to pass through the toll gate to 30 seconds if idle time of the toll gate is 10% and the average queue length at the gate is more than 5 vehicles. Check whether the installation of the second gate is justified. **07**

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