Reg. No. : | | | | | | | | | | |

Question Paper Code: 31041

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Fourth Semester

Computer Science and Engineering

01UMA421 - APPLIED STATISTICS AND QUEUEING NETWORKS

(Common to Information Technology)

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

(Statistical table is permitted)

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State Baye's theorem.
2. A continuous random variable X that can assume any value between x = 2 and x = 5 has density function given by $f(x) = k(1+x)$. Find the value of k.
3. Write down any two properties of joint distribution function F(x, y).
4. State the central limit theorem.
5. What are the basic assumptions involved in ANOVA?
6. Write any two differences between RBD and CRD.
7. Define steady state and transient state in Queueing theory.
8. What are the characteristics of queueing system?
9. When a M/G/1 queueing model will become a classic M/M/1 queueing model.
10. What do you mean by bottleneck of a network?

PART - B (5 x 16 = 80 Marks)

11. (a) (i) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution. (8)

(ii) Derive MGF, mean and variance of Geometric distribution. (8)

Or

(b) (i) The distribution function of a random variable is given by $F(x) = 1 - (1+x)^{e^{-x}}$ for $x \geq 0$. Find the density function, mean and variance. (8)

(ii) In a large consignment of electric bulb 10% are defective random sample of 20 is taken for inspection. Find the probability that (1) All are good bulbs (2) At most there are 3 defective bulbs (3) Exactly there are 3 defective bulbs. (8)

12. (a) (i) Calculate the correlation coefficient and obtain the lines of regression for the following heights (in inches) of fathers (X) and their sons(Y). (8)

X	:	65	66	67	67	68	69	70	72
Y	:	67	68	65	68	72	72	69	71

(ii) If $X_1, X_2, X_3, \ldots X_n$ are Poisson variates with parameter $\lambda = 2$, use central limit theorem to estimate $P(120 \leq S_n \leq 160)$, where $S_n = X_1 + X_2 + X_3 + \ldots + X_n$ and $n=75$. (8)

Or

(b) (i) The joint p.d.f of X and Y is given by $f(x, y) = e^{-(x+y)}$, $x > 0$, $y > 0$. Find the probability density function of $U = \frac{X+Y}{2}$. (8)

(ii) A random sample of size 100 is taken from a population whose mean is 60 and variance is 400. Using central limit theorem, with what probability can we assert that the mean of the sample will not differ from $\mu = 60$ by more than 4? (8)

13. (a) A tea company appoints four salesman *A*, *B*, *C* and *D* and observes their sales in three seasons-summer, winter and monsoon. The figures (in lakhs) are given in the following table.

	A	B	C	D
Summer :	36	36	21	35
Winter :	28	29	31	32
Monsoon :	26	28	29	29

(i) Do the salesman significantly differ in performance?

(ii) Is there significant difference between the seasons? (16)

Or

(b) The following is the Latin square design when 4 varieties of seeds are tested. Set up the analysis of variance table and state your conclusion

P(105)	Q(95)	R(125)	S(115)
R(115)	S(125)	P(105)	Q(105)
S(115)	R(95)	Q(105)	P(115)
Q(95)	P(135)	S(95)	R(115)

(16)

14. (a) Find the mean number of customers in the queue and system, average waiting time in the queue and system of M/M/1 queueing model. (16)

Or

(b) Honda auto service station has 5 mechanics, each of whom can service a motorbike in 2 hours on an average. The motorbikes are registered at a single counter and then sent for servicing to different mechanics. Motorbikes arrive at the service station at an average rate of 2 per hour. Determine

(i) Probability that the system shall be idle,

(ii) Probability that there shall be 3 and 8 motorbikes in the station,

(iii) Expected number of motorbikes in the service station and queue,

(iv) Average waiting time in the queue,

(v) Average time spent by a motorbike in waiting and getting serviced. (16)

15. (a) Derive Pollaczek-khinchine formula of M/G/1 queue. (16)

Or

(b) In a computer programs for execution arrive according to poission law with a mean of 5 per min. Assume that the system is busy. The service time is

(i) uniform between 8 and 12 seconds,

(ii) a discrete distribution with values equal to 2,7,12 seconds and corresponding probabilities 0.2, 0.5 and 0.3. Find L_s , L_q , W_s , W_q. (16)
