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

Question Paper Code: 34001

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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. State the axioms of probability.
3. State Liapounoff's form of Central limit theorem.
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. Write down the basic principles of experimental design.
8. What are the characteristics of queueing system?
9. Define series queues. Give examples.
10. What do you mean by bottleneck of a network?

PART - B (5 x 16 = 80 Marks)

11. (a) Three machines *A*, *B* and *C* with capacities proportional to 4:2:3 are producing identical items. The percentage that the machine produce defectives are 4%, 3% and 5% respectively. At the end of a day from the total production one item is selected at random and is found defective. What is the chance that it came from machine *B*. (16)

Or

(b) 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. (16)

12. (a) Given the following joint density function

$$f(x,y) = \begin{cases} \frac{8}{k}xy, & 0 \le x \le y \le 2 \\ 0, & \text{otherwise} \end{cases}$$

Find (1) value of *k*, (2) marginal density functions,

(3) $P(X \le 1/Y < 3/2)$, (4) $P(X + Y \le 1)$.

(16)

Or

(b) 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? (16)

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) Analyse the variance in the following Latin square of yields (in kgs) of paddy where *A,B,C,D* denote the different methods of cultivation

D122	A121	C123	B122
B124	C123	A122	D125
A120	B119	D120	C121
C122	D123	B121	A122

Examine whether the different methods of cultivation have given significantly different yields. (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) A departmental store has a single cashier. During the rush hours, customers arrive at a rate of 20 customers per hour. The cashier takes on an average 2.5 minutes per customer for processing.

(i) What is the probability that the cashier is idle and a customer shall have to wait in the queue?

(ii) What is average number of customers and average time spent by a customer in the system?

(iii) What is the average queue length and average time a customer spends in the queue?

(iv) What is the expected number of customers in a queue, if it exists?

(v) Find the average waiting time of a customer in the queue, if he has to wait. (16)

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

Or

(b) In a network of 3 service stations 1, 2, 3 customers arrive 1, 2, 3 from outside, in accordance with Poisson process having rates 5, 10,15 respectively. the service times at the 3 stations are exponential with respective rates 10, 50, 100. A customer completing service at station 1 is equally like to (1) go to station 2, (2) go to station 3 and (3) leave the system. A customer departing from service at station 2 always goes to station 3. A departure from service at station at station 3 is equally like to go to station 2 or leave the system. Then

(i) What is the average number of customers in the system consisting of all the three stations?

(ii) What is the average time a customer spends in the system. (16)
