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Question Paper Code: 53022

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Third Semester

Computer Science Engineering

15UMA322 - PROBABILITY, STATISTICS AND QUEUEING SYSTEMS

(Common to Information Technology branch)

(Regulation 2015)

(Statistical tables are may be permitted)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The limiting relative frequency approach of probability is known as CO1- R
(a) Classical Probability (b) Statistical probability
(c) Mathematical probability d) a priori probability
2. The parameter of a Binomial distribution is CO1- R
(a) np (b) npq (c) pq (d) nq
3. Which of the following is not a possible value of the correlation coefficient? CO2- R
(a) Negative 0.9 (b) Zero (c) Positive 1.5 (d) Negative 0.05
4. In regression if $b_{yx} < 1$ then b_{xy} is CO2- R
(a) less than 1 (b) greater than 1 (c) equal to 1 (d) any negative values
5. How many dependent variables must you have for an ANOVA to be conducted? CO3- R
(a) only 1 continuous variable (b) 2 nominal variables
(c) 3 ordinal variables (d) 3 ratio variables
6. In a RBD with 'b' blocks and 'v' treatment then the error degrees of freedom are CO3- R
(a) $b(v-1)$ (b) $v(b-1)$ (c) $vb-1$ (d) $(b-1)(v-1)$

7. Define queue discipline CO4- R
- (a) Degree to which members of the queue renege
- (b) Sequence in which members of the queue arrived
- (c) Degree to which members of the queue are orderly and quiet
- (d) Sequence in which members of the queue are serviced
8. In Kendall's notation (a/b/c):(d/e) and c represents CO4- R
- (a) Service discipline (b) customer behavior (c) number of server (d) inter arrival time
9. Network of M/M/m queues CO5- R
- (a) Jackson (b) Product form networks
- (c) BCMP (d) Denning and Buzen
10. Let $W_s = W_q + \frac{1}{\mu}$ is known as CO5- R
- (a) Steady State formula (b) Transient formula
- (c) P-K formula (d) Little's formula

PART – B (5 x 2= 10 Marks)

11. Define Moment generating function CO1- App
12. Describe the conditional distribution of the two dimensional random variable CO2- R
13. Construct the ANOVA table for Complete Randomised design CO3- R
14. Explain the Queueing system CO4- R
15. State the characteristics of open Jackson networks CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) The urns contents of urns I,II and III are as follows CO1- App (8)
- 1 white, 2 black and 3 red balls
- 2 white, 1 black and 1 red balls and
- 4 white, 5 black and 3 red balls.
- One urn is chosen at random and two balls drawn from it. They happen to be white and red respectively. What is the probability that they come from urns I,II and III?
- (ii) The mean yield for one- acre plot is 662 kilos with a standard deviation 32 kilo. Assuming normal distribution, how many one-acre plots in a batch of 1,000 plots would you expect to have yielded (i) over 700 kilos (ii) below 650 kilos. CO1- App (8)

Or

- (b) In a certain binary communication channel, the probability a transmitted zero is received as zero is 0.95 and the probability that a transmitted one is received as a one is 0.90. Assuming that the probability a zero is transmitted is 0.4. Find
- (a) probability a one is received
- (b) probability a one was transmitted given a one was received.

CO1- App (16)

17. (a) Two random variables have the joint probability density function

CO2- U (16)

$$f(x, y) = \begin{cases} 2 & ; x > 0, y > 0, x + y < 1 \\ 0 & ; otherwise \end{cases}$$

find correlation coefficient of x and y

Or

- (b) Obtain the equation of the lines of regression from the following data:

CO2- U (16)

X :	1	2	3	4	5	6	7
Y :	9	8	10	12	11	13	14

18. (a) The following data represents the number of units of production per day turned out by 5 different workers using 4 different types of machines

CO3- Ana (16)

		Machine Type			
		A	B	C	D
Workers	1	44	38	47	36
	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

- (a) Test whether the five workers differ with respect to mean productivity.

Test whether the mean productivity is the same for the four different machine types .

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 :

CO3- Ana (16)

D 122	A 121	C 123	B 122
B 124	C 123	A 122	D 125
A 120	B 119	D 120	C 121
C 122	D 123	B 121	A 122

Examine whether the different methods of cultivation have given significantly different yields.

19. (a) A one-person barbershop has 6 chairs to accommodate people waiting for hair cut. Assume customers who arrive when all 6 chair are full, leave without entering the barbershop. Customers arrive at the average rate of 3 per hour and spend an average of 15 minutes in the barbershop. Find (i) the probability that a customer can get directly into the barber chair upon arrival. (ii) the expected numbers of customer waiting for hair cut (iii) the effective arrival rate (iv) the time a customer can expect to spend in the barbershop. CO4- App (16)

Or

- (b) In a 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 the service time distribution is also exponential with an average of 36 minutes. Calculate (i) the probability of yard is empty (ii) the average queue length assuming the line capacity of the yard is 9 trains. CO4- App (16)

20. (a) Derive the Pollaczek-Khintchine formula CO5- App (16)

Or

- (b) (i) For a 2 stage (service point) sequential queue model with blockage, compute the average number of customers in the system and the average time that a customer has to spend in the system if $\lambda = 1, \mu_1 = 2, \mu_2 = 1$ CO5- App (8)

- (ii) Write a short note on open queueing network. CO5- App (8)