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Question Paper Code: 53022

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Third Semester

Computer Science Engineering

15UMA322 - PROBABILITY, STATISTICS AND QUEUEING SYSTEMS

(Common to Information Technology)

(Regulation 2015)

(Statistical tables are may be permitted)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. If A and B are Independent $P(A)=\frac{1}{2}$ and $P(B)=\frac{1}{5}$, find $P(A \cap B)$. CO1- R

   (a) $\frac{1}{100}$ (b) $\frac{1}{7}$ (c) $\frac{1}{10}$ (d) $\frac{6}{10}$

2. The Normal curve is _____ shaped. CO1- R

   (a) Square (b) bell (c) circle (d) rectangular

3. The value of k such that $f(x,y)= k(1-x)(1-y)$ for $0 < x,y < 1$ is to be a joint p.d.f is CO2- R

   (a) 2 (b) 4 (c) 6 (d) 8

4. The correlation between price and demand of a commodity is an example of CO2- R

   (a) Positive correlation (b) Negative correlation

   (c) Covariance (d) Regresion

5. Latin squares are most widely used in the field of CO3- R

   (a) medicine (b) industry (c) agriculture (d) astronomy

6. If $S_1^2 > S_2^2$ then generalize F CO3- R

(a) $\frac{S_2^2}{S_1^2}$ (b) $\frac{S_1^2}{S_2^2}$ (c) $\frac{S_1}{S_2}$ (d) $\frac{S_2}{S_1}$

7. For (M/M/1):(∞/FCFS) queueing model, the value of P(N > K) is equal to CO4 -R

(a) ρ^{k-2} (b) ρ^{k-1} (c) ρ^{k} (d) ρ^{k}

8. In a Queuing system when the operating characteristics are dependent on time then it is called _____ state. CO4 -R

(a) Transient (b) Steady (c) Transient & Steady (d) none of these

9. The traffic equations for an closed Jackson network is given by CO5- R

(a) $r_j = \sum_{i=1}^{\infty} \lambda_j p_{ij}$ (b) $r_j = \sum_{i=0}^{k} \lambda_j p_{ij}$ (c) $\lambda_j = \sum_{i=1}^{k} \lambda_i p_{ij}$ (d) $y = mx + c$

10. In this M/G/I model, if $G \equiv M$, viz, the service time T follows an exponential distribution with parameter μ, then $E(T) =$_____ CO5- R

(a) $\frac{1}{\mu^2}$ (b) $\frac{1}{\mu}$ (c) $\frac{1}{\lambda}$ (d) $\frac{1}{\lambda^2}$

PART – B (5 x 2= 10Marks)

11. If the probability is 0.05 that a certain kind of measuring device will show excessive drift, what is the probability that the sixth of these measuring devices tested will be the first to show excessive drift? CO1 -U

12. The two regression lines are 8x−10y+66=0 , 40x−18y−214=0.Find mean values of x and y. CO2- U

13. Name the basic principles of experimental design. CO3 -R

14. Write down the Little's formula for queueing model. CO4- R

15. What do you mean by *M/G/*1 Queue? CO5 -U

PART – C (5 x 16= 80Marks)

16. (a) (i) Establish the Memory less property of exponential distribution. CO1 -App (8)

(ii) In a bolt factory machines A, B, C manufacture respectively 25, 35 and 40 percent of the total. Of their output 5,4 and 2 percent are defective bolts respectively. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B or C. CO1 -App (8)

Or

(b) (ii) Derive m.g.f, mean and variance for exponential distribution. CO1 -App (16)

17. (a) Determine the correlation coefficient between random variables X and Y whose joint p.d.f is CO2 -App (16)

$$f(x,y)=\begin{cases}2-x-y\,, 0\le x\le 1; 0\le y\le 1\\ 0,\ otherwise\end{cases}$$

Or

(b) (i) The joint probability mass function of (X, Y) is given by $P(x,y)=k(2x+3y);\ x=0,1,2.\ y=1,2,3.$ Find the marginal probability distributions of X and Y. CO2- Ana (8)

(ii) The joint probability density function of the two random variables X and Y be $f(x,y)=e^{-(x+y)};\ x>0, y>0$. CO2- Ana (8)

Find the p.d.f of $U=\frac{X+Y}{2}$.

18. (a) (i) Calculate the correlation co-efficient for the following heights (in inches) of CO3- Ana (8)

Fathers X their sons Y.

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

(ii) If X and Y are random variables having the joint density function CO3 -Ana (8)

$$f(x,y)=\frac{1}{8}(6-x-y);\ 0<x<2; 2<y<4$$
$$=0,\ otherwise$$

Find (I) $P(X<1\cap Y<3)$ (II) $P(X+Y<3)$

(III) $P(X<1/Y<3)$

Or

(b) Four farmers each used four types of manures for a crop (area and other considerations are same) and obtained the yields (in quintals) as below. CO3- Ana (16)

Manures / farmers	Treatments			
	1	2	3	4
A	22	16	21	12
B	23	17	19	13
C	21	14	18	11
D	22	15	19	10

19. (a) Customer arrive at a one-man barber shop according to a Poisson process with a mean inter arrival time of 20 minutes. Customers spend an average of 15 minutes in the barber's chair. If an hour is used as the unit of time, then CO4 -App (16)

(1) Find the probability that a customer need not wait for a hair cut?

(2) How much time can a customer expect to spend in the barbershop?

(3) Find the average time that a customer spends in the queue?

(4) What is the probability that there will be 6 or more customers waiting for service?

Or

(b) A 2 person barber shop has 5 chairs to accommodate the waiting customers. Potential customers, who arrive when all 5 chairs are full, leave without entering the barber shop. Customers arrive at the average rate of 4 per hour and spend an average of 12 minutes in the barber's chair. Compute P_0, P_1 , P_7 and W_s. CO4 -App (16)

20. (a) Explain Non-Markovian queueing model. And, Derive P-K formula. CO5- U (16)

Or

(b) Derive the Pollaczek-Khintchine formula. CO5- U (16)