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Question Paper Code: 50033

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

Third Semester

Computer Science and Engineering

15UMA322 – PROBABILITY STATISTICS AND QUEUING SYSTEMS

(Common to IT Branch)

(Regulation 2015)

(Statistical table may be permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. A variable that can assume any possible value between two points is called

   (a) Discrete random variable (b) Continuous random variable
   (c) Discrete sample space (d) Random variable

2. If Var(X) =5 and Var(Y) = 10, then Var($2X + Y$) is

   (a) 15 (b) 20 (c) 10 (d) 30

3. The value of coefficient of correlation lies between

   (a) 0 to 1 (b) 0 to ∞ (c) -1 to 1 (d) $-\infty$ to ∞

4. In regression analysis, the variable that is being predicted is the

   (a) response, or dependent, variable
   (b) independent variable
   (c) intervening variable
   (d) is usually x

5. Randomized block design is a

   (a) three restrictional design (b) two restrictional design
   (c) one restrictional design (d) no restrictional design

6. While analyzing the data of a k x k Latin square, the error degrees of freedom in analysis of variance is equal to

(a) $(k-1)(k-2)$ (b) $k(k-1)(k-2)$ (c) $k(k-1)$ (d) k^2-2

7. Mean value of the service rate is denoted by

(a) λ (b) μ (c) ρ (d) θ

8. In Kendel's notation $(a/b/c):(d/e)$, 'c' stands for

(a) probability for arrival (b) probability for service
(c) number of servers (d) queue discipline

9. For $(M/M/1):(\infty/FIFO)$ model, the formula for $E(N_S)$=

(a) L_s (b) L_q (c) W_s (d) W_q

10. The probability that a customer has to wait more than 15 minutes to get his service completed in a $M/M/1$ queuing system if λ=6 per hour and μ=10 per hour is

(a) e^{-2} (b) e^{-1} (c) $e^{-1/2}$ (d) 1

PART - B (5 x 2 = 10 Marks)

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?

12. If the two regression lines are $8x-10y = -66$ and $40x-18y = 214$, find the mean values of X and Y.

13. What are the basic principles of experimental design?

14. What do you mean by transient state and steady state queuing system?

15. Write down Pollaczek – Khintchine (P-K) formula.

PART - C (5 x 16 = 80 Marks)

16. (a) If $P(X=x)=\begin{cases} Kx, & x = 1,2,3,4,5 \\ 0, & otherwise \end{cases}$, represents a probability mass function,

Identify the value of K, $P(x$ being a prime number$)$, $P\left\{\frac{1}{2} < x < \frac{5}{2} / x > 1\right\}$,

Find the distribution function. (16)

Or

(b) (i) Buses arrive at a specified stop at 15 min. intervals starting at 7 a.m , that is, they arrive at 7,7:15,7:30,7:45 and so on . If the passenger arrives at the stop at a random time that is uniformly distributed between 7 and 7:30 a.m. find the

probability that he waits (a) less than 5 min for a bus and (b)more than 10min for a bus. (8)

(ii) In a normal distribution, 7 % of the items are under 35 and 39% are under 63. Find the mean and standard deviation of the distribution. (8)

17. (a) Determine the correlation coefficient between random variables X and Y whose joint p.d.f is $f(x,y)=\begin{cases}2-x-y\,, 0\le x\le 1; 0\le y\le 1\\ 0,\ otherwise\end{cases}$ (16)

Or

(b) (i) If the p.d.f of X is $f_X(x) = 2x, 0 < x < 1$, find the p.d.f of $Y=3X+1$. (8)

(ii) Two random variables X and Y are related as $Y= 4X+9$, find the correlation coefficient between X and Y. (8)

18. (a) The three samples below have been obtained from normal population with equal variance. Test the hypothesis that the sample means are equal. (16)

Sample A	Sample B	Sample C
8	7	12
10	5	9
7	10	13
14	9	12
11	9	14

Or

(b) In a Latin square experiment given below , the yields is quintals per acre on the paddy crop carried out for testing the effect of five fertilizers A, B, C, D, E. Analyse the data for variations. (16)

A105	B95	C125	D115
C115	D125	A105	B105
D115	C95	B105	A115
B95	A135	D95	C115

19. (a) Customers arrive at a watch repair shop according to Poisson process at a rate of one per every 10 minutes and the service time is an exponentially random variable with mean 8 min. (i) Find the average number of customers *Ls* in the shop. (ii) Find the average time a customer spends in the shop *Ws*. (iii) Find the average number of customers in the queue *Lq* (iv) What is the probability that the server is idle. (16)

Or

(b) At a port there are 6 unloading berths and 4 unloading crews. When all the berths are full, arriving ships are diverted to an overflow facility 20 kms down the river. Tankers arrive according to Poisson process with a mean of 1 in every 2 hours. It takes for an unloading crew, on the average, 10 hours to unload a tanker, the unloading time following an exponential distribution. Find (i) How many tankers are at the port on average? (ii) How long does a tanker spent at the port on the average? (iii) What is the average arrival rate at the overflow facility? (16)

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

Or

(b) A Car manufacturing plant uses one big crane for loading cars into a truck. Cars arrive for loading by the crane according to Poisson distribution with a mean of 5 cars per hour. Given that the service time for all cars is constant and equal to 6 minutes determine L_S , L_q, W_s, W_q. (16)

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