



B.E. /B.Tech.(Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2011
Information Technology
FOURTH SEMESTER – (REGULATIONS 2004)
MA503 – PROBABILITY AND STATISTICS

Time : 3 hrs

Max Marks: 100

Answer All Questions
Part – A (10 X 2 = 20 Marks)

1. Let A and B be events with $P(A)=0.6, P(B)=0.3$ and $P(A \cup B) = 0.7$. Find $P(A \cap B)$ and $P(A / B)$?
2. The probability that a husband and wife will be alive for 20 years from now are given by 0.92 and 0.96 respectively. Find the probability that in 20 years (i) both will be alive (ii) neither will be alive.
3. Find the mean and variance of the distribution whose moment generating function is

$$\frac{0.4e^t}{1-0.6e^t}$$

4. If X has uniform distribution in $(-1,3)$ and Y has exponential distribution with parameter λ , find λ such that $\text{Var}(X)=\text{Var}(Y)$.
5. Consider the joint probability density function of X and Y

$$f_{XY}(x, y) = \begin{cases} 9e^{-3x}e^{-3y}, & \text{if } x, y > 0 \\ 0, & \text{otherwise} \end{cases} \quad \text{Find } P(Y > 1 / X > 2).$$

- 6 Given the two regression lines $3X + 12Y = 19$, $3Y + 9X = 46$. Find the coefficient of correlation between X and Y.
7. What is Type I error and Type II error?
8. Give any two applications of chi-square test.
9. Compare Completely Randomized design and Randomized-Block design.
10. What are the basic principles of design of experiments?

Part – B (5 X 16 = 80 Marks)

11. i) There are three dice out of which one is a fair die, the other two false with one in which even numbers are repeated twice and the other one in which odd numbers are repeated twice. One die is chosen at random and thrown. If the outcome turns out to be a prime number, what is the probability that the fair die was chosen and thrown?

(8 Marks)

- ii) A random variable X assumes the value $-3, -2, -1, 0, 1, 2, 3$ and given $P(X=0)=P(X>0)=P(X<0)$,
 $P(X=3)=2P(X=2)=3P(X=1)$
and $P(X=x)=P(X=-x)$ for $x=1, 2, 3$. Find the probability distribution of X. (8 Marks)

12. a)(i) State and prove memory less property of Exponential Distribution. (8 Marks)
(ii) Derive the mean and variance of Uniform distribution. (8 Marks)

OR

- b) (i) For a binomial random variable X mean is 6 and standard deviation is 2, Find $P(X>2)$? And also find $M_X(t)$. (8 Marks)
(ii) The lifetime of a certain brand of an electric bulb may be considered as a random variable with mean 1200h and standard deviation 250h. Find the probability using Central Limit Theorem, that the average life time of 60 bulbs exceeds 1250h. (8 Marks)

- 13) a) (i) Suppose that X and Y are independent random variables with density functions $f_X(x) = 1, 0 < x < 1$ and $f_Y(y) = \frac{1}{2}, 0 < y < 2$. Find the density function of X+Y. (8 Marks)
(ii) Two random variables X and Y have the following joint density function

$$f_{XY}(x, y) = \begin{cases} 4xy, & 0 < x < 1, 0 < y < 1 \\ 0 & \text{otherwise} \end{cases} . \text{ Find the conditional density functions.}$$

(8 Marks)

OR

- b) Two random variables X and Y have the following joint density function

$$f_{XY}(x, y) = \begin{cases} \frac{x^3 y^3}{16} & 0 < x < 2, 0 < y < 2 \\ 0 & \text{otherwise} \end{cases} . \text{ Find the regression lines.}$$

(16 Marks)

- 14) a) (i) The following random samples are measurements of the heat-producing capacity (in millions of calories per ton) of specimens of coal from two mines:

Mine 1	8260	8130	8350	8070	8340	
Mine 2	7950	7890	7900	8140	7920	7840

Use the 0.02 level of significance to test whether it is reasonable to assume that the variances of the two populations' samples are equal. (8 Marks)

- (ii) To test the claim that the resistance of electric wire can be reduced by more than 0.050 ohm by alloying, 32 values obtained for standard wire yielded $\bar{x}_1 = 0.136 \text{ ohm}$ and $s_1 = 0.004 \text{ ohm}$, and 32 values obtained for alloyed wire yielded $\bar{x}_2 = 0.083 \text{ ohm}$ and $s_2 = 0.005 \text{ ohm}$. At the 0.05 level of significance, does this support the claim?

(8 Marks)

OR

14. b) (i) A large electronics firm that hires many workers with disabilities wants to determine whether their disabilities affect such workers' performance. Use the level of significance $\alpha = 0.05$ to decide on the basis of the sample data shown in the following table whether it is reasonable to maintain that the disabilities have no effect on the workers' performance:

	Performance		
	Above average	Average	Below average
Blind	21	64	17
Deaf	16	49	14
No disability	29	93	28

(10 Marks)

(ii) It is desired to determine whether there is less variability in the silver plating done by Company 1 than in that done by Company 2. If independent random samples of size 1 of the two companies' work yield $s_1 = 0.035 \text{ mil}$ and $s_2 = 0.062 \text{ mil}$, test the null hypothesis $\sigma_1^2 = \sigma_2^2$ against the alternative hypothesis $\sigma_1^2 < \sigma_2^2$ at the 0.05 level of significance.

(6 Marks)

15. a) The following are the lives in hours of four brands of electric lamps:

Brand A: 1610,1610,1650,1680,1700,1720,1800

Brand B: 1580,1640,1640,1700,1750

Brand C: 1460,1550,1600,1620,1640,1660,1740,1820

Brand D: 1510,1520,1530,1570,1600,1680

Perform an analysis of variance and test the homogeneity of the mean lives of the four brands of lamps.

(16 Marks)

OR

b) In a 4 X 4 Latin square experiment, the data collected is given in the matrix below, yield per plot given in quintals for the four different cultivation treatments A,B,C and D. Perform the analysis of variance.

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

(16 Marks)