

D.K.M.COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

DEPARTMENT OF MATHEMATICS

QUESTION BANK –ODD SEMESTER

MATHEMATICAL STATISTICS I

I B.SC MATHEMATICS

UNIT – I SECTION-A 2 MARKS

1. Define Random experiment?
2. Define Mutually exclusive event?
3. Define Exhaustive event?
4. Define Equally likely event?
5. Define Mathematical probability?
6. What is the probability that a one-leap year selected at random has 52 sundays?
7. Prove that $p(\emptyset)=0$?
8. Prove that $P(\overline{A})=1-P(A)$?
9. Prove that $P(A)\leq P(B)$, If $A\leq B$?
10. A bag contains 10 red, 5 white balls . what is the probability of drawn in one white ball?

SECTION-B 5 MARKS

1. A bag contains 4 red, 2 white and 3 black balls . 2 balls are drawn at random. What is the probability that both are red.
2. Four cards are drawn from a well shuffled pack . What is the probability that all the cards drawn are black?
3. State and prove additive theorem for two events?
4. Three coins tossed simultaneously find the probability of getting (i) atleast 2 heads (ii) atmost 2 heads (iii) Exactly 2 heads?
5. A card is drawn from a well shuffled pack of playing cards. What is the probability that it is either a spade or an ace?

6. The probability that a student pass a physics test is $\frac{2}{3}$ and the probability that he passed both a physics and an english test in $\frac{14}{45}$. The probability that he passes the English ?

7. 3 Newspapers A,Band C are published in certain city it is estimated from a survey that of the adult population 20% read A, 160% read B, 14% read C , 8% read both A and B, 5% read both A and C, 4% read both B and C , 2% read all 3 . What is the % read at least one of Newspaper?

SECTION-C 10 MARKS

1. State and prove Addition theorem on 3 events?

2. State and prove Boolean's Inequality?

3. State and prove Baye's theorem?

4. The content of 3 bags(urn) as follows

(I) 3 red, 4 black, 3 white balls,

(ii) 4 red, 2 black , 4 white balls,

(iii) 3 red, 3 black , 2 white balls.

One bag is choosen at random from which 3 balls are drawn at random. The balls are found to be it is came from bag(I), bag(ii) and bag(iii)?

5. In a bolt factories machine A,B and C produce respectively 25% , 35% and 40% of the total of their output 5,4,and 2% are defective bolts. A bolts is drawn at random from the product and it is found to be defective. What is the probability that it was manufactured by Machine A,Band C?

UNIT -II SECTION-A 2 MARKS

1. Define Random variables?

2. Define Discrete and Continous random variable?

3. Define Probability distributive function?

4. Define Probability mass function?

5. Define Probability density function?

6. Write down any two Properties of distributive functions?

7. Define Joint Probability mass function?

8. Define Joint Probability density function?

9. Define Mathematical Expectation?
10. Write down any two properties of Expectation?
11. Define Variance?
12. Write down any two properties of variance?
13. Define moments?
14. Define moment generating function?
15. Write and prove that any two properties of moment generating function?

SECTION-B 5 MARKS

1. Two dies are thrown simultaneously. Let X denotes the sum of the dies. Find (I) Probability mass function, (ii) $P(X < 3)$, (iii) $P(X \geq 3)$, (iv) Probability distributive function?

2. The joint probability of distribution of 2 dimensional random variable X and Y are given by $P(X=0, Y=1)=1/3$, $P(X=1, Y=-1)=1/3$, $P(X=1, Y=1)=1/3$
 (i) Find the marginal distribution function of X and Y
 (iix) Find the conditional probability function of X is given $Y=1$

3. The random variable X has probability function

X=x	-3	-2	1	0	1	2	3
P(X=x)	1/9	1/9	1/9	1/3	1/9	1/9	1/9

Find the distribution function of X and find probability mass function

$$Y = 2x^2 + 3x + 4$$

4. Prove that properties of Expectation?

5. A random variable X has the following probability function

X=x	-1	0	1
P(X=x)	0.2	0.3	0.5

Find (i) $E(x)$ (ii) $E(x^2)$ (iii) $E(2x+1)$

6. Find the mean of the random variable X whose function is given by $f(x)=\{x, 0 \leq x < 1$

$$\frac{3-x}{4}, 1 \leq x < 3 \text{ and } 0 \text{ otherwise}$$

7. Show that the expected number of failure preceeding the first success in a serious of bernoulin trials with a constant probability of success P is $\frac{1-p}{p}$

8. Find the mean and variance for the following date

X	1	2	3	4
P(X)	0.1	0.3	0.4	0.2

9. Prove that properties of moment generating function?

Find the rth moment about the origin and hence find mean and variance of the distribution whose p.d.f is given by

$$2(1-x), 0 \leq x < 1$$

$$f(x)=\begin{cases} 0 & \text{otherwise} \end{cases}$$

10. Find the M.G.F of a random variable whose moments are $\mu_r' = (r+1)!2^r$

UNIT III SECTION-A 2 MARKS

1. Define characteristic function?
2. Write down any two properties of characteristic function?
3. State Inversion theorem?
4. State Uniqueness theorem?
5. Write down the application of uniqueness theorem?

SECTION-B 5 MARKS

1. Find the characteristic function for the distribution with p.d.f $f(x)= 1/2a$, $|x| \leq a$ and otherwise 0

2. Find the characteristic function of the exponential distribution $f(x) =$

$$\frac{1}{\theta} e^{-\frac{x}{\theta}}, x \geq 0 \text{ and otherwise } 0$$

3. Find the characteristic function of the uniform distribution (or) rectangular distribution?

SECTION-C 10 MARKS

1. Find the characteristic function of the binomial distribution and also obtained its mean and variance?

2. Find the characteristic function of the poisson distribution. And also find mean and variance?

3. The characteristic function of random variable X is given by

$$\phi(t) = 1 - |t|, |t| \leq 1 \text{ and } 0 \text{ when } |t| > 1$$

Find its distribution function?

UNIT IV SECTION-A 2 MARKS

1. Define correlation?

2. Define correlation co-efficient?

3. Write down the formula for Rank correlation?

4. Write down the formula for karl-pearsons co-effecient of correlation?

SECTION-B 5 MARKS

1. If X and Y are two uncorrelated random variable and if $U = X + Y$, $V = X - Y$. Find the correlation between U and V.

2. Calculate the correlation co-effecient for the following data

X:	1	2	3	4	5	6	7	8	9
Y:	9	8	10	12	11	13	14	16	15

3. Calculate correlation co-effecient for the following data

Height of father's: 65 66 67 67 68 69 70 72

Height of son's : 67 68 65 68 72 72 69 71

4. The ranking of 10 students in 2 subjects A and B are as follows:-

A: 3 5 8 4 7 10 2 1 6 9

B: 6 4 9 8 1 2 3 10 5 7

5. Find the rank correlation of co-efficient of the following data.

Marks in maths : 68 70 50 90 85 100

Marks in English: 53 65 95 67 92 80

SECTION-C 10 MARKS

1. Prove that correlation co-efficient always lies between -1 and 1.

2. Find the rank of correlation of co-efficient for the following data.

Marks in Accounts : 90 75 63 95 71 75 31 24 40 76

Marks in Statistics : 65 62 65 75 55 90 36 32 42 56

UNIT V SECTION-A 2 MARKS

1. Define regression coefficient?

2. Define Regression?

3. Write down the regression line Y on X and X on Y?

4. Write down the formula byx and bxy?

SECTION-B 5 MARKS

1. Find the two regression equation for the following data

X: 50 60 50 60 80 50 80 40 70

Y: 30 60 40 50 60 30 70 50 60

2. Two variable are given by the following data $\bar{X}=20$, $\bar{Y}=15$, $\sigma_x=4$, $\sigma_y=3$, $r=0.7$. Find the regression equation and also find the values of y when X=24?

3. Distinguish between correlation and Regression?

4. Find the regression equation, regression co-efficient for the following data
A.M 6, 8 S.D 5, 40/3?

5. Find the angle between the two regression line?

SECTION-C 10 MARKS

1. In a correlation the following value

Mean : 20 200

Standard deviation : 18 170

correlation co-efficient is 0.6. Find the regression equations and also find
X=50?

2. Find the equation of the line of regression for the following data.

Paper I : 45 55 56 58 60 65 68 70 75 80 85

paper II: 56 50 48 60 64 62 65 70 74 82 90

3. Find the correlation co-efficient regression co-efficient and regression lines
from the following data.

$$\sum x = 125, \sum y = 100, \sum xy = 508, \sum x^2 = 65, \sum y^2 = 460 \quad N=25$$

4. The regression lines X on Y and Y on X are $16-9y=44$ $y=x+5$. Find the
variance of X. If variance of Y is 16. Also find the co-variance of X and Y?