

PSG COLLEGE OF ARTS & SCIENCE
(Autonomous)

MSc(SS) DEGREE EXAMINATION MAY 2023
(Second Semester)

Branch – SOFTWARE SYSTEMS (Five years Integrated)

PROBABILITY AND STATISTICS

Time: Three Hours

Maximum: 50 Marks

SECTION – A (5 MARKS)

Answer ALL Questions
ALL Questions Carry EQUAL Marks (5 × 1 = 5)

- If A and B are two events which have no point in common, the events A and B are _____.
(i) complementary to each other (ii) independent
(iii) mutually exclusive (iv) dependent
- The mean and variance of binomial distribution are 8 and 4, respectively. Then, $P(X=1)$ is equal to _____.
(i) $\frac{1}{2^{12}}$ (ii) $\frac{1}{2^4}$ (iii) $\frac{1}{2^6}$ (iv) $\frac{1}{2^8}$
- Whether a test is one sided or two sided depends on _____.
(i) alternative hypothesis (ii) composite hypothesis
(iii) null hypothesis (iv) simple hypothesis
- Equality of several normal population means can be tested by _____.
(i) ANOVA (ii) F-test (iii) Chi-square test (iv) t-test
- The estimate of β in the regression equation $Y = \alpha + \beta X + e$ by the method of least square is _____.
(i) biased (ii) unbiased (iii) consistent (iv) efficient

SECTION – B (15 MARKS)

Answer ALL Questions
ALL Questions Carry EQUAL Marks (5 × 3 = 15)

- (a) State and prove multiplication theorem on probability.
OR
(b) A bag contains 7 Red, 12 White and 4 Green balls. What is the probability that:
(i) all 3 balls are white (ii) 3 balls from each colour.
- (a) The joint probability density function of two-dimensional random variables X and Y is given by $f(x, y) = \begin{cases} 2, & 0 \leq x \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$ find the distribution of $U = X+Y$.
OR
(b) Derive the mean and variance of binomial distribution.
- (a) Obtain $100(1-\alpha)\%$ confidence limits (for large sample) for the parameter λ of the Poisson distribution: $f(x, \lambda) = \frac{e^{-\lambda} \lambda^x}{x!}; x=0,1,2,\dots$
OR
(b) Describe in detail about hypothesis testing.
- (a) The sales data of an item in six shops before and after a special promotional campaign are as under:

Shops	A	B	C	D	E	F
Before Campaign	53	28	31	48	50	42
After Campaign	58	29	30	55	56	45

Can the campaign be judged to be a success? Test at 5% level of significance.
OR

9. (b) 1000 students at college level were graded according to their I.Q and the economic conditions of their homes. Use chi-square test to find out whether there is any association between economic condition at home and I.Q.

Given $\chi_{0.05}^2 = 3.84$

Economic Condition	IQ		Total
	High	Low	
Rich	460	140	600
Poor	240	160	400
Total	700	300	1000

10. (a) State the properties of regression coefficients.

OR

- (b) Describe the meaning of independent variable and dependent variable in regression.

SECTION – C (30 MARKS)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 × 6 = 30)

11. (a) State and prove Baye's theorem.

OR

- (b) From a city population, the probability of selecting (1) a male or a smoker is 7/10, (2) a male smoker is 2/5, and (3) a male, if a smoker is already selected is 2/3. Find the probability of selecting (i) a non-smoker (ii) a male and (iii) smoker, if a male is first selected.

12. (a) The joint probability density function of three dimensional random variables X, Y and Z is given by $f(x,y,z) = e^{-(x+y+z)}$; $x>0, y>0, z>0$. Find joint MGF of X, Y and Z, and hence find the moments of X, Y and Z.

OR

- (b) Derive the mean and variance of normal distribution.

13. (a) Describe the procedure of testing the significance of two proportions.

OR

- (b) Intelligence test on two groups of boys and girls gave the following results:

	Mean	S..D	N
Girls	75	15	150
Boys	70	20	250

Is there a significance difference in the mean score obtained by boys and girls?

14. (a) Two random samples were drawn from two normal population and their values are
 A: 66 67 75 76 82 84 88 90 92
 B: 64 66 74 78 82 85 87 92 93 95 97
 Test whether the two populations have the same variance at the 5% level of significance (F=3.36) at 5% level for $v_1 = 10$ and $v_2 = 8$.

OR

- (b) The following table shows the lives (in hours) of four batches of electric lamps:

Batches	Life of Bulbs in Hours							
1	1600	1610	1650	1680	1700	1720	1800	
2	1580	1640	1640	1700	1750			
3	1460	1550	1600	1620	1640	1660	1740	1820
4	1510	1520	1530	1570	1600	1680		

Perform an analysis of variance of these data and show that a significance test does not reject their homogeneity.

15. (a) Find Regression equations from the following data:

X	28	41	40	38	35	33	46	32	36	33
Y	30	34	31	34	30	26	28	31	26	31

OR

- (b) Elucidate in detail about linear regression and least squares.