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 x 1 = 5)

1. Probability value always
   (i)0   (ii)1   (iii)0 to 1   (iv)< 1

2. If p(x) = x/15, x=1,2,3,4,5 then the value of p[x=1or2] is
   (i)1/7   (ii)1/5   (iii)1/15   (iv)2/15

3. The standard deviation of the sampling distribution of a statistic is known as
   (i) Parameter   (ii) Sample Variance
   (iii)Standard error   (iv) Sample Standard Deviation

4. To test the equality of variances, we use
   (i) t test   (ii)chi square test
   (iii)F test   (iv)Z test

5. Which test is sensitive to the differences in location between $f_1(x)$ and $f_2(x)$ but not to differences in their shapes
   (i)Sign test   (ii) Median test
   (iii)Run test   (iv) Mann-Whitney U test

SECTION - B (15 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 3 = 15)

6. (a) State and prove addition theorem on Probability.
   (Or)
   (b) Four cards are drawn at random from a pack of 52 cards, Find the probability that
      (i) They are a king, a queen , a jack and an ace.
      (ii) Two are kings and two are queens.
      (iii) Two are black and two are red.

7. (a) A variable X is distributed at random between the values 0 and 4 and its probability density function is given by
   $$f(x) = k \, x^3(4-x)^2$$
   Find the value of k and the mean.
   (Or)
   (b) Explain about the physical condition if binomial distribution.

8. (a)Explain the procedure of testing the significance of a single mean.
   (Or)
   (b) Random samples drawn from the countries gave the following data relating the heights of adults males

	Country A	Country B
Mean height (in inches)	67.42	67.25
Standard deviation (in inches)	2.58	2.50
Number of Samples	1000	1200

   Is the difference between the standard deviations significant?

9. (a) Explain the procedure for testing the significance of equality of two population variances.

(Or)

(b)The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained

Days:	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
No. of parts demanded:	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week at 5% level of significance.

10 (a)Explain the steps for one-way ANOVA.

(Or)

(b) The following are the arrangement of 25 men (M) and 15 women (W) lined up to purchase tickets for a premier picture show:

MWWMMMWMMWMWMWWWMMMWMMWWWMMMMMMWWWMMMMMM

Test for randomness at 5% level of significance.   [Table value 1.96 at 5%]

SECTION -C (30 Marks)
Answer ALL questions
ALL questions carry **EQUAL** Marks   (5 x 6 = 30)

11 (a) A committee of 4 persons is to be appointed from 3 executives of the production department, 4 executives of the purchase department, 2 executives of the marketing department and 1 chartered accountant. Find the probability of forming the committee in the following manner:

(i)   There must one from each category.
(ii)   It should have at least one from purchase department.
(iii)   The chartered accountant must be in the committee.

(Or)

(b) State and prove Baye's theorem.

12 (a)   For the following bivariate probability distribution of X and Y

X\Y	1	2	3	4	5	6
0	0	0	1/32	1/32	2/32	3/32
1	1/16	1/16	1/8	1/8	1/8	1/8
2	1/32	1/32	1/64	1/64	0	2/64

Find (i) $P(X \leq 1, Y = 2)$,   (ii) $P(X \leq 1)$,   (iii) $P(Y \leq 3)$ and (iV) $P(X < 3, Y \leq 4)$

(Or)

(b) Discuss about the characteristics of Normal distribution.

13 (a) In a random sample of 1000 persons from town A, 400 are found to be consumers of wheat. In a sample of 800 from town B, 400 are found to be consumers of wheat. Do these data reveal a significant difference between town A and town B, so far as the proportion of wheat consumers is concerned?

(Or)

(b) The mean height obtained from a random sample of size 100 is 64 inches. The S.D of the distribution of the height of the population is known to be 3 inches. Test the statement that the mean height of the population is 67 inches at 5% level of significance. Also set up 99% confidence   limits of the mean height of the population.

14 (a) Two random samples were drawn from two normal populations 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 variances at the 5% level of significance $[F_{0.05}=3.36$ for $v_1=10, v_2=8]$

(Or)

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

Economic Condition	IQ			Total
	High	Medium	Low	
Rich	160	300	140	600
Poor	140	100	160	400
Total	300	400	300	1000

15 (a) Three samples below have been obtained from normal populations with equal variances. Test the hypothesis that the sample means are equal at 5% level of significance.

Sample 1   8   10   7   14   11

Sample 2   7   5   10   9   9

Sample 3   12   9   13   12   14

$[F_{0.05}=3.58$ for $v_1=2, v_2=12]$

(Or)

(b) The following data relate to the daily production of cement (in m.tones) a large plant for 30 days:

11.5 10.0 11.2 10.0 12.3 11.1 10.2 9.6 8.7 9.3

9.3 10.7 11.3 10.4 11.4 12.3 11.4 10.2 11.6 9.5

10.8 11.9 12.4 9.6 10.5 11.6 8.3 9.3 10.4 11.5

Use sign test to test the null hypothesis that the plant's average daily production of cement is 11.2m tones against alternative hypothesis is < 11.2 m tones at the 0.05 level of significance.

Z-Z-Z END