

**PSG COLLEGE OF ARTS AND SCIENCE**  
(AUTONOMOUS)  
**BCom DEGREE EXAMINATION DECEMBER 2023**  
(Second Semester)  
Branch – **COMMERCE (BUSINESS ANALYTICS)**  
**APPLIED BUSINESS STATISTICS - I**

Time: Three Hours

Maximum: 50 Marks

**SECTION - A (5 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks (5 x 1 =5)

1. On rolling a fair six-sided die, the probability of obtaining an even number is \_\_\_\_\_.  
(a) 1/6 (b) 1/3 (c) 1/2 (d) 2/3
2. The standard deviation of Binomial distribution with parameters n and p is \_\_\_\_\_.  
(a)  $\sqrt{np}$  (b)  $\sqrt{npq}$  (c)  $\sqrt{qp}$  (d)  $\sqrt{nq}$
3. The standard deviation of the sampling distribution of a statistic is known as \_\_\_\_\_.  
(a) population (b) sample (c) standard error (d) parameter
4. The degrees of freedom for paired t-test based on n pairs of observations is \_\_\_\_\_.  
(a) 2n-1 (b) n-2 (c) n-1 (d) 2(n-1)
5. The non-parametric equivalent of an unpaired sample t-test is \_\_\_\_\_.  
(a) Sign test (b) Mann-Whitney U test  
(c) Wilcoxon signed-rank test (d) Kruskal-Wallis test

**SECTION -B (15 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks (5 x 3=15)

6. (a) State and prove the multiplication theorem of probability.  
(or)  
(b) If two dice are thrown, what is the probability that the sum is (i) greater than 8, and (ii) neither 7 nor 11?
7. (a) Prove additive and multiplicative property of expectation of independent random variables X and Y.  
(or)  
(b) In binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 successes are 0.4096 and 0.2048 respectively. Find the parameter 'p' of the distribution.
8. (a) Write down the general procedure for testing of hypothesis.  
(or)  
(b) A sample of 900 members has a mean of 3.4 cm and a standard deviation of 2.61 cm. Is the sample from a large population of mean 3.25 cm and a standard deviation 2.61 cm?
9. (a) A mechanist is making engine parts with axle diameter of 0.700 inch. A random sample of 10 parts shows a mean diameter of 0.742 inch with a S.D. of 0.040 inch. Compute the statistics you would use to test whether the work is meeting the specifications.  
(or)  
(b) A random sample of employees of a large company was selected and the employees were asked to complete a questionnaire. One question asked was whether the employee was in favour of the introduction of flexible working hours. The following table classifies the employees by their responses and by their area of work.

Response	Area of work		Total
	Production	Non- Production	
In favour	129	171	300
Not in favour	31	69	100
Total	160	240	400

Test whether there is evidence of a significant association between the response and the area of work.

10. (a) The following data represents the number of hours that a rechargeable hedge trimmer operates before a recharge is required 1.5,5.2,0.9, 1.3, 2.0, 1.6, 1.8,1.5,2.6,1.2,1.7. Use the sign to test the hypothesis at a 0.05 level of significance that this particular trimmer operates, on average 1.8 hours before requiring a recharge.  
(or)  
(b) A random sample of 15 adults living in a small town is selected to estimate the proportion of voters favouring a certain candidate for mayor. Each individual was also asked if he or she was a college graduate. By letting Y and N designate the response of 'yes' and 'no' to the education question, the following sequence was obtained.

NNNN YY N YY N.Y NNNN

**SECTION – C (30 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks (5 x 6 = 30)

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

(or)

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

12. (a) A discrete random variable X has the probability function given below:

X	1	2	3	4	5	6	7	8
P(X)	2a	4a	6a	8a	10a	12a	14a	4a

Determine the values of  $a$ ,  $P(X < 3)$  and  $P(X \geq 5)$ 

(or)

- (b) The atoms of radioactive elements are randomly disintegrating. If every gram of this element, on average emits 3.9 alpha particles per second, what is the probability that during the next second the number of alpha particles emitted from 1 gram is (a) atmost 6 (b) atleast 3 and atmost 6. (
- $e^{-3.9} = 0.020$
- ).

13. (a) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near the residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal, are the same against that they are not, at 5% level.

(or)

- (b) The means of two large samples of 1000 and 2000 members are 67.5 inches and 68 inches respectively. Can the samples be regarded as drawn from the same population with a standard deviation of 2.5 inches? Test at 5% level of significance.

14. (a) Two random samples drawn from two normal populations are given below. Test whether the two populations have the same variances.

Sample I	20	16	26	27	23	22	18	24	25	19		
Sample II	17	23	32	25	22	24	28	6	31	20	33	27

(or)

- (b) The following table gives the number of refrigerators sold by a 4 salesman in three months:

Month	Salesman			
	A	B	C	D
I	50	40	48	39
II	46	48	50	45
III	39	44	40	59

Is there a significant difference in the sales made by the four salesmen?

Is there a significant difference in the sales made during different months?

15. (a) The following data gives the lifetime of bulbs of two different brands.

Brand X	80	100	90	110	125	130	70	
Brand Y	100	120	80	140	130	160	115	120

Apply K-S test to test whether the brands differ with respect to average life.

(or)

- (b) Three different feeds are to be compared to determine that they have the same distribution of weight gains on experimental animals (such as pigs). Suppose 12 animals are divided at random into three groups of four animals and each group has a different feed. The following results are obtained. Test that the median weight gains due to three feeds are same by Kruskal-Wallis test at 5% level of significance.

Feed	Weight Gains			
1	104	110	106	102
2	112	117	115	114
3	120	126	121	128

Z-Z-Z

END