

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Fourth Semester)

Branch – MATHEMATICS WITH COMPUTER APPLICATIONS

ADVANCED MATHEMATICAL STATISTICS - II

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Simple random sampling can be applied if the population units are a) finite b) homogeneous c) heterogeneous d) both a and b	K1	CO1
	2	Which estimator has lesser variability? a) unbiased b) consistent c) efficient d) sufficient	K1	CO1
2	3	The estimators which are unbiased and has minimum variance are said to be _____. a) MVUE b) MVBE c) UBE d) BLUE	K1	CO2
	4	The second order central moment of a population is given by _____. a) μ'_2 b) μ_2 c) β'_2 d) β_2	K2	CO2
3	5	Which hypothesis is rejected for possible rejection? a) Simple b) composite c) null d) alternative	K1	CO3
	6	The rule or formula to test the null hypothesis is _____. a) Alternative hypothesis b) expected value c) level of significance d) test statistic	K2	CO3
4	7	The test used for testing the significance of two dependent samples is _____. a) One sample t-test b) Paired t-test c) Independent samples t-test d) F-test	K1	CO3
	8	If there are two samples of sizes 8 and 7, the degrees of freedom of F-test is _____. a) (5,6) b) (4,2) c) (8,7) d) (7,6)	K2	CO4
5	9	In a chi square test the actual frequencies are also called as _____ frequencies. a) observed b) expected c) tabulated d) calculated	K1	CO4
	10	The chi square degrees of freedom for goodness of fit with 7 observations is _____. a) 7 b) 6 c) 5 d) 8	K2	CO4

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain stratified random sampling and its allocation methods with examples.	K2	CO1
	(OR)			
	11.b.	Explain consistent and sufficient estimators with examples.		

Cont...

2	12.a.	Solve and show that the sample mean $\bar{x}$ is sufficient for estimating the parameter λ of the Poisson distribution.	K3	CO2																						
	(OR)																									
	12.b.	Identify and describe the steps involved in the method of moments for estimating parameters of a distribution.																								
3	13.a.	Apply the concepts of Type I error, Type II error, power of a test, and critical region to testing situations.	K3	CO3																						
	(OR)																									
	13.b.	Identify and write the properties of t and F distributions.																								
4	14.a.	Analyze the procedure for testing the significance of two means for large samples and explain each step.	K4	CO4																						
	(OR)																									
	14.b.	The following data refers to the weights (kg) of 10 subjects before and after a 6-week diet program. Test whether the diet had an effect on weight. <table><tr><td>Before</td><td>85</td><td>90</td><td>88</td><td>92</td><td>87</td><td>91</td><td>89</td><td>86</td><td>93</td><td>88</td></tr><tr><td>After</td><td>83</td><td>88</td><td>86</td><td>90</td><td>86</td><td>89</td><td>87</td><td>85</td><td>91</td><td>87</td></tr></table>			Before	85	90	88	92	87	91	89	86	93	88	After	83	88	86	90	86	89	87	85	91	87
Before	85	90	88	92	87	91	89	86	93	88																
After	83	88	86	90	86	89	87	85	91	87																
5	15.a.	The last digit (0–9) of 100 randomly chosen phone numbers are given below to test whether all digits occur equally often. <table><tr><td>Digit</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>Oi</td><td>8</td><td>12</td><td>9</td><td>11</td><td>10</td><td>9</td><td>10</td><td>8</td><td>13</td><td>10</td></tr></table> Test whether the digits are uniformly distributed.	Digit	0	1	2	3	4	5	6	7	8	9	Oi	8	12	9	11	10	9	10	8	13	10	K4	CO4
	Digit	0	1	2	3	4	5	6	7	8	9															
	Oi	8	12	9	11	10	9	10	8	13	10															
(OR)																										
15.b.	Explain the chi-square test for the independence of two attributes.																									

SECTION -C (30 Marks)

Answer ANY THREE questions
ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO																			
1	16	State and prove the Rao-Blackwell theorem.	K2	CO1																			
2	17	Solve and estimate α and β in the case of Pearson's type III distribution by the method of moments: $f(x, \alpha, \beta) = \frac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x}, 0 \leq x \leq \infty$	K3	CO2																			
3	18	State and derive the probability density function of students t – distribution with usual notations.	K3	CO3																			
4	19	The productivity (units/hour) of employees using two different work methods, A and B is given below. <table border="1"><tr><td>Method A</td><td>12</td><td>15</td><td>14</td><td>16</td><td>13</td><td>14</td><td>17</td></tr><tr><td>Method B</td><td>10</td><td>12</td><td>11</td><td>13</td><td>12</td><td>10</td><td>14</td></tr></table> Test whether there is a difference in mean productivity between the two methods.	Method A	12	15	14	16	13	14	17	Method B	10	12	11	13	12	10	14	K4	CO4			
Method A	12	15	14	16	13	14	17																
Method B	10	12	11	13	12	10	14																
5	20	The table below shows results of a survey in which 250 respondents was categorized according their age and satisfaction towards a new brand of mobile phone. Test the hypothesis that the two criteria of classification are independent. <table border="1"><tr><th rowspan="2">Age group</th><th colspan="3">Satisfaction level</th></tr><tr><th>Low</th><th>Medium</th><th>High</th></tr><tr><td>Under 25</td><td>60</td><td>25</td><td>5</td></tr><tr><td>25-50</td><td>40</td><td>40</td><td>25</td></tr><tr><td>50 & above</td><td>15</td><td>20</td><td>20</td></tr></table>	Age group	Satisfaction level			Low	Medium	High	Under 25	60	25	5	25-50	40	40	25	50 & above	15	20	20	K4	CO4
Age group	Satisfaction level																						
	Low	Medium	High																				
Under 25	60	25	5																				
25-50	40	40	25																				
50 & above	15	20	20																				