22STU515N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Fifth Semester)

Branch- **STATISTICS**

STATISTICAL INFRENCE-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	A statement about a population developed for the purpose of testing is called (i) Hypothesis (ii) Hypothesis testing (iii) Level of significance (iv) Test statistic	K1	CO1
	2	The hypothesis under test is (i) Simple hypothesis (ii) Alternative hypothesis (iii) Null hypothesis (iv) Composite hypothesis	K2	CO1
2	3	A test T of size α is said to be a ___________ test if there is no other test of the same size whose power is more than that of T (i) Power of a test (ii) Uniformly most powerful test (iii) Most powerful test (iv) All of the above	K1	CO2
	4	If the likelihood ratio is λ, the variable -2log λ is approximately distributed as _________ (i) t – test (ii) F – test (iii) Chi – square test (iv) Z -test	K2	CO2
3	5	The degrees of freedom for statistic – t for paired t – test based on n pairs of observations is (i) 2 (n – 1) (ii) n – 1 (iii) 2n – 1 (iv)n	K1	CO3
	6	The range of statistic – t is (i) - 1 to + 1 (ii) - ∞ to ∞ (iii) 0 to ∞ (iv) 0 to 1	K2	CO3
4	7	If all the frequencies of classes are same, the value of χ^2 is (i) 0 (ii) 1 (iii) 2 (iv) 3	K1	CO4
	8	Degrees of freedom for statistic – χ^2 in case of contingency table of order(2 x 2) is (i) 3 (ii) 2 (iii) 1 (iv) 4	K2	CO4
5	9	In case of two attributes A and B, the ultimate class frequencies are: (i) (A) (ii) (AB) (iii) (α) (iv) (B)	K1	CO5
	10	In case of two attributes A and B, the class frequency (αB) in terms of other class frequencies is (i) (B) + (AB) (ii) (B) - (AB) (iii) (Ab) – (B) (iv) N – (AB)	K2	CO5

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SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks $(5 \times 7 = 35)$

Module No.	Question No.	Question	K Level	CO
1	11.a.	If $x \geq 1$ is the critical region for $H_0 : \theta = 2$ against the alternative $\theta = 1$, on the basis of the single observation from the population, $f(x,\theta) = \theta\, e^{-\theta x}, 0 \leq x < \infty$. Obtain the values of Type I and Type II errors.	K1	CO1
		(OR)		
	11.b.	Let X have a p.d.f of the form $f(x,\theta) = \begin{cases} \frac{1}{\theta} e^{-\frac{x}{\theta}}; 0 < x < \infty, \theta > 0 \\ 0, \quad elsewhere \end{cases}$ To test $H_0 : \theta = 2,$ against $H_1 : \theta = 1,$ use the random sample x_1, x_2 of size 2 and define a critical region $W = \{(x_1, x_2) : 9.5 \leq x_1 + x_2\}$ Find : (i) Power of the test (ii) Significance level of the test.		
2	12.a.	Examine whether a best critical region exists for testing the null hypothesis $H_0 : \theta = \theta_0$ against the alternative $H_1 : \theta > \theta_0$ for the parameter θ of the distribution $f(x,\theta) = \dfrac{1+\theta}{(x+\theta)^2}, 1 \leq x < \infty$	K1	CO1
		(OR)		
	12.b.	List the properties of likelihood ratio test		
3	13.a.	A test was given to a large group of boys who scored on the average 64.5 marks. The same test was given to a group of 400 boys who scored an average of 62.5 marks with a standard deviation 12.5 marks. Examine if the difference is significant	K2	CO2
		(OR)		
	13.b.	A test was given to a large group of boys who scored on the average 64.5 marks. The same test was given to a group of 400 boys who scored an average of 62.5 marks with a standard deviation 12.5 marks. Examine if the difference is significant.		
4	14.a.	In one sample of 8 observations, the sum of the squares of the deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5 per cent level.	K3	CO3
		(OR)		
	14.b.	It is believed that the precision of an instrument is no more than 0.16. Write down the null and alternate hypothesis for testing this belief. Carry out the test at 1% level given 11 measurements of the same subject on the instrument: 2.5, 2.3, 2.4,2.3, 2.5, 2.7,2.5,2.6,2.6,2.7,2.5		
5	15.a.	Show that if $\dfrac{(A)}{N} = x, \dfrac{(B)}{N} = 2x, \dfrac{(C)}{N} = 3x,$ and $\dfrac{(AB)}{N} = \dfrac{(BC)}{N} = \dfrac{(CA)}{N} = y$ Then the value of neither x nor y can exceed $\dfrac{1}{4}$.	K3	CO4
		(OR)		
	15.b.	800 candidates of both sexes appeared at an examination. The boys outnumbered the girls by 15 % of the total. The number of candidates who passed exceed the number failed by 480. Equal number of boys and girls failed in the examination, prepare a 2 x 2 table and find the coefficient association		

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SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

<table>
<tr><th>Module No.</th><th>Question No.</th><th>Question</th><th>K Level</th><th>CO</th></tr>
<tr><td>1</td><td>16</td><td>State and Prove Neyman Pear son lemma</td><td>K1</td><td>CO1</td></tr>
<tr><td>2</td><td>17</td><td>Describe the test for mean of a Normal population.</td><td>K1</td><td>CO1</td></tr>
<tr><td>3</td><td>18</td><td>Twelve students were given intensive coaching and tests were before and after coaching. Is there any improvement due to coaching?
<table>
<tr><td>Marks in I test(before)</td><td>50</td><td>42</td><td>51</td><td>26</td><td>35</td><td>42</td><td>60</td><td>41</td><td>70</td><td>55</td><td>62</td><td>38</td></tr>
<tr><td>Marks in II test(after)</td><td>62</td><td>40</td><td>61</td><td>35</td><td>30</td><td>52</td><td>68</td><td>51</td><td>84</td><td>63</td><td>72</td><td>50</td></tr>
</table></td><td>K2</td><td>CO2</td></tr>
<tr><td>4</td><td>19</td><td>The following fiqures show the distribution of digits in numbers chosen at random from a telephone directory:
<table>
<tr><td>Digits</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><td>Total</td></tr>
<tr><td>Frequency</td><td>1026</td><td>1107</td><td>997</td><td>966</td><td>1075</td><td>933</td><td>1107</td><td>972</td><td>964</td><td>853</td><td>10000</td></tr>
</table>
Test whether the digits may be taken to occur equally frequently in the directory.</td><td>K3</td><td>CO3</td></tr>
<tr><td>5</td><td>20</td><td>The following table gives the distribution of students and also of regular players among them, according to age in completed years:
<table>
<tr><td>Age in years</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr>
<tr><td>No of students</td><td>250</td><td>200</td><td>150</td><td>120</td><td>100</td><td>80</td></tr>
<tr><td>Regular players</td><td>200</td><td>150</td><td>90</td><td>48</td><td>30</td><td>12</td></tr>
</table>
Calculate the coefficient of association between majority and playing habit, on the assumption that majority is attained in 18th year.</td><td>K3</td><td>CO4</td></tr>
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