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25STU204

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Second Semester)

Branch – **STATISTICS**

PROBABILITY DISTRIBUTIONS

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	The mean of a Binomial distribution with parameters n and p is (i) np (ii) $np(1-p)$ (iii) $p(1-p)$ (iv) $nq(1-p)$	K1	CO1
	2	The Poisson distribution is a limiting case of the (i) Negative Binomial distribution (ii) Binomial distribution (iii) Normal distribution (iv) Hypergeometric distribution	K2	CO1
2	3	The Negative Binomial distribution can be derived as a sum of (i) Poisson-distributed variables (ii) independent geometric distributions (iii) normal distributions (iv) hypergeometric distribution	K1	CO2
	4	The Geometric distribution is a special case of the (i) Negative Binomial distribution (ii) Hypergeometric distribution (iii) Normal distribution (iv) Exponential distribution	K2	CO2
3	5	The skewness of a normal distribution is (i) 0 (ii) 1 (iii) -1 (iv) 2	K1	CO3
	6	A normal distribution is completely determined by its (i) Mean and variance (ii) Mean and mode (iii) Mean and median (iv) Mean and skewness	K2	CO3
4	7	The shape parameter in the Gamma distribution controls the (i) Skewness (ii) Variance (iii) Location (iv) Scale	K1	CO4
	8	The Beta distribution is defined over the interval (i) $(0,1)$ (ii) $(-\infty,\infty)$ (iii) $(-1,1)$ (iv) $(0,\infty)$	K2	CO4
5	9	The degrees of freedom of a Chi-square distribution are (i) Always positive (ii) Always negative (iii) Zero (iv) Any real number	K1	CO5
	10	The F-distribution is used to test (i) Equality of variances (ii) Equality of means (iii) Equality of medians (iv) Homogeneity of samples	K2	CO5

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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.	Define Bernoulli distribution. Obtain the mean and variance of Bernoulli distribution.	K3	CO1
		(OR)		
	11.b.	Explain the recurrence relation for the Poisson distribution.		
2	12.a.	Describe lack of memory property of the Geometric distribution.	K4	CO2
		(OR)		
	12.b.	Obtain Binomial distribution as a limiting case of Hypergeometric distribution.		
3	13.a.	Define Rectangular (Uniform) distribution. Obtain its mean and variance.	K4	CO3
		(OR)		
	13.b.	Derive the moment-generating function (MGF) and the mean deviation about the mean of a Normal distribution.		
4	14.a.	Describe the first and second kind of Beta distributions.	K5	CO4
		(OR)		
	14.b.	Obtain the mean, variance and moment generating function of exponential distribution.		
5	15.a.	If X is chi-square variate with n d.f., then prove that for large n, $\sqrt{2X} \sim N(\sqrt{2n},1)$.	K3	CO5
		(OR)		
	15.b.	Derive Student's t – distribution with its assumptions & conditions.		

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>Seven coins are tossed and the number of heads noted. The experiment is repeated 128 times and the following distribution is obtained:
Fit a binomial distribution assuming (i) The coin is unbiased (ii) The nature of the coin is not known
<table>
<tr><td>No. of heads</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>Total</td></tr>
<tr><td>Frequencies</td><td>7</td><td>6</td><td>19</td><td>35</td><td>30</td><td>23</td><td>7</td><td>1</td><td>28</td></tr>
</table></td><td>K4</td><td>CO1</td></tr>
<tr><td>2</td><td>17</td><td>Describe multinomial distribution and also derive the moments of multinomial distribution.</td><td>K4</td><td>CO2</td></tr>
<tr><td>3</td><td>18</td><td>In a distribution exactly normal, 10.03% of the items are under 25 kilogram weight and 89.97% of the items are under 70 kilogram weight. What are the mean and standard deviation of the distribution.</td><td>K5</td><td>CO3</td></tr>
<tr><td>4</td><td>19</td><td>If X and Y are independent Gamma variates with parameters μ and v respectively, show that are independent and that U is a variate and Z is a variate.</td><td>K4</td><td>CO4</td></tr>
<tr><td>5</td><td>20</td><td>Derive Chi-square distribution and state its applications.</td><td>K4</td><td>CO5</td></tr>
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Z-Z-Z END