<table>
<tr><th colspan="2">US04CSTA22
Unit – III Question Bank</th></tr>
<tr><td>1</td><td>Let $Xi, i = 1, 2, \dots n$ be n independent normal variates with parameters μ and σ^2. Obtain the distribution of $\bar{X}$ where $\bar{X} = \frac{1}{n}\sum Xi$. Identify and name it.</td></tr>
<tr><td>2</td><td>The m.g.f of a r.v. X is $M(t) = (0.6 + 0.4e^t)^{30}$
Find the approximate value of $(i) P(3 < X \leq 8) (ii) P(X > 7)$. State clearly, the result you have used to solve the required probability.</td></tr>
<tr><td>3</td><td>Let $Xi \sim N(\mu i, \sigma i^2), i = 1, 2 \dots n$ be n independent variates. Obtain the distribution of $\sum Xi$. Identify and name it.</td></tr>
<tr><td>4</td><td>If X and Y follows respectively $P(2)$ and $P(3)$ distribution. Obtain the distribution of $X + Y$. State $E(X + Y)$ and $V(X + Y)$.</td></tr>
<tr><td>5</td><td>In an examination the mean and standard deviation of marks in Mathematics and Chemistry are as given below:
<table><tr><th>Subject</th><th>Mean</th><th>Variance</th></tr><tr><td>Mathematics</td><td>50</td><td>225</td></tr><tr><td>Chemistry</td><td>45</td><td>100</td></tr></table>Assume the marks in the two subjects be independent normal variates. Obtain the probability that a student got total marks (i) between 100 and 125 (ii) at least 125 (iii) exactly 120.</td></tr>
<tr><td>6</td><td>Let $Xi, i = 1, 2, \dots n$ be n independent $N(\mu, \sigma^2)$ variates. Find the distribution of $\sum_{i=1}^{n} aiXi$ where $ai's$ are non – zero constants hence show that $\bar{X}$ has $N\left(\mu, \frac{\sigma^2}{n}\right)$.</td></tr>
<tr><td>7</td><td>A die is rolled independently 120 times. Approximate the probability that
(i) More than 42 rolls are odd numbers (ii) the number of two's and three's is from 40 to 45 times.</td></tr>
<tr><td>8</td><td>The m.g.f. of a r.v. X is $M_X(t) = e^{32(e^t-1)}$
(i) Name the distribution of X (ii) Approximate the following probabilities:
(a) $P(X \leq 22)$ (b) $P(27 \leq X \leq 45)$ (c) $P(\lvert X \rvert > 32)$</td></tr>
<tr><td>9</td><td>Show that the sum of two independent Poisson variates is also a Poisson variate?</td></tr>
<tr><td>10</td><td>The probability that a patient will get reaction of a temiflu injection is 0.40. If 120 patients are given that injection, find the probabilities that (i) Exactly 45 (ii) 40 or more, will get reaction from that injection.. State clearly, the result which you have used to solve the required probabilities</td></tr>
<tr><td>11</td><td>Let $Xi, i = 1, 2, \dots n$ be n independent $N(\mu, \sigma^2)$ variates. Find the distribution of $\sum_{i=1}^{n} aiXi$ where $ai's$ are non – zero constants hence show that $\bar{X}$ has $N\left(\mu, \frac{\sigma^2}{n}\right)$.</td></tr>
<tr><td>12</td><td>Show that the sum of k independent Bernoulli variates is a binomial variate.</td></tr>
<tr><td>13</td><td>About 10% of the population is left – handed. Use the normal approximation to approximate the probability that in a class of 150 students (i) at least 25 of them are left – handed. (ii) between 15 and 20 are left – handed.</td></tr>
<tr><td>14</td><td>Prove that the sum of two independent binomial variates is also a binomial variate. Is the difference of two binomial variates is binomial?</td></tr>
<tr><td>15</td><td>State and prove additive property of Geometric distribution.</td></tr>
<tr><td>16</td><td>About 12% of the population is universal donor. Use the normal approximation to approximate the probability that in a class of 150 students, (i) at most 32 (ii) between 18 and 26 are universal donor.</td></tr>
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