<u>**NAPOMENA:**</u> **Na ispitu je dozvoljeno nositi samo date formule, bez bilo čega dodatno dopisano na ovim papirima. Na ispitu je dozvoljeno korišćenje digitrona, dok upotreba mobilnog telefona za računanje ili bilo koje druge svrhe nije dozvoljena. Pre početka ispita OBAVEZNO isključiti mobilni telefon.**

$$P(B|A) = \frac{P(AB)}{P(A)}, \qquad P(A) > 0, \qquad P(A|B) = \frac{P(AB)}{P(B)}, \qquad P(B) > 0.$$

$$P(AB) = P(B|A) \cdot P(A) = P(A|B) \cdot P(B).$$

$$P(A_i|B) = \frac{P(A_i) \cdot P(B|A_i)}{P(B)}, \; i = 1, 2, \dots, n \qquad P(B) = \sum_{i=1}^{n} P(A_i) \cdot P(B|A_i), \forall B \in \mathcal{F}.$$

$$r_{X,Y} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}},$$

$$y = a + b \cdot x, \quad b = \frac{n\sum_i x_i y_i - \sum_i x_i \sum_i y_i}{n\sum_i x_i^2 - (\sum_i x_i)^2}, \quad a = \bar{y} - b \cdot \bar{x}$$

$$p \in \left[\frac{n}{n + z_\beta^2}\left(\frac{S_n}{n} + \frac{z_\beta^2}{2n} - z_\beta\sqrt{\frac{S_n(n - S_n)}{n} + \frac{z_\beta^2}{4n^2}}\right), \frac{n}{n + z_\beta^2}\left(\frac{S_n}{n} + \frac{z_\beta^2}{2n} + z_\beta\sqrt{\frac{S_n(n - S_n)}{n} + \frac{z_\beta^2}{4n^2}}\right)\right]$$

$$m \in \left[\bar{x}_n - z_\beta \frac{\sigma}{\sqrt{n}}, \bar{x}_n + z_\beta \frac{\sigma}{\sqrt{n}}\right].$$

$$m \in \left[\bar{x}_n - t_{n-1,1-\beta} \frac{\bar{S}_n}{\sqrt{n-1}}, \bar{x}_n + t_{n-1,1-\beta} \frac{\bar{S}_n}{\sqrt{n-1}}\right].$$

$$\sigma \in \left[0, \frac{n\bar{S}_n^2}{\chi^2{}_{n-1,\beta}}\right].$$

$$\sigma \in \left[\frac{n\bar{S}_n^2}{\chi^2{}_{n-1,\frac{1-\beta}{2}}}, \frac{n\bar{S}_n^2}{\chi^2{}_{n-1,\frac{1+\beta}{2}}}\right].$$

$$R = x_{max} - x_{min}.$$

$$SD(m) = \frac{1}{N}\sum_{i=1}^{N}|x_i - m|, \qquad SD(m) = \frac{1}{N}\sum_{i=1}^{k} f_i|x_i - m|, \qquad SD(m) = \frac{1}{N}\sum_{i=1}^{k} f_i|x_{s_i} - m|,$$

$$M_r = \frac{\sum_{i=1}^{k} f_i (x_i - m)^r}{N}, \; r = 0,1,2,3,4, \dots \quad m_r = \frac{\sum_{i=1}^{k} f_i {x_i}^r}{N}, \; r = 0,1,2,3,4, \dots$$

$$M_r = \frac{\sum_{i=1}^{k} f_i \left(x_{s_i} - m\right)^r}{N}, \; r = 0,1,2,3,4, \dots \quad m_r = \frac{\sum_{i=1}^{k} f_i x_{s_i}^r}{N}, \; r = 0,1,2,3,4, \dots$$

$$m_r = \frac{\sum_{i=1}^{k} f_i x_{s_i}^r}{N}, \; r = 0,1,2,3,4, \dots \; \sigma^2 = \frac{\sum_{i=1}^{N} {x_i}^2}{N} - m^2, \quad \sigma^2 = \frac{\sum_{i=1}^{k} f_i {x_i}^2}{N} - m^2,$$

$$\sigma^2 = \frac{\sum_{i=1}^{k} f_i {x_{s_i}}^2}{N} - m^2, \quad \sigma = \sqrt{\sigma^2}, \quad V_x^2 = \frac{\sigma^2}{m^2}, \quad V_x = \frac{\sigma}{m} \cdot 100.$$

$$Z_i = \frac{x_i - m}{\sigma}, \alpha_3 = \frac{M_3}{\sigma^3},$$

$$S_k = \frac{m - M_o}{\sigma} \text{ ili } S_k = \frac{3(m - M_e)}{\sigma}, \qquad S_{kQ} = \frac{Q_1 + Q_3 - 2M_e}{Q_1 - Q_3}$$

$$M_4 = \frac{\sum_{i=1}^{k} f_i (x_i - m)^4}{N}, \quad M_4 = \frac{\sum_{i=1}^{k} f_i \left(x_{s_i} - m\right)^4}{N}.$$

$$\alpha_4 = \frac{M_4}{\sigma^4}.$$

$$m = \frac{x_1 + x_2 + \cdots + x_N}{N} = \frac{\sum_{i=1}^{N} x_i}{N}$$

,

$$m = \frac{f_1 x_1 + f_2 x_2 + \cdots + f_k x_k}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_i}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_i}{N}$$

$$m = \frac{f_1 x_{s_1} + f_2 x_{s_2} + \cdots + f_k x_{s_k}}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_{s_i}}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_{s_i}}{N})$$

$$m = \frac{N_1 m_1 + N_2 m_2}{N_1 + N_2}.$$

$$G = \sqrt[N]{x_1 \cdot x_2 \cdot \cdots \cdot x_N} = \sqrt[N]{\prod_{i=1}^{N} x_i}, G = \sqrt[N]{x_1^{f_1} \cdot x_2^{f_2} \cdot \dots \cdot x_k^{f_k}}, G = \sqrt[N]{x_{s_1}^{f_1} \cdot x_{s_2}^{f_2} \cdot \dots \cdot x_{s_k}^{f_k}}$$

$$H = \frac{N}{\frac{1}{x_1} + \frac{1}{x_2} + \cdots + \frac{1}{x_N}} = \frac{N}{\sum_{i=1}^{N} \frac{1}{x_i}}, H = \frac{f_1 + f_2 + \cdots + f_k}{\frac{1}{x_1} f_1 + \frac{1}{x_2} f_2 + \cdots + \frac{1}{x_k} f_k} = \frac{\sum_{i=1}^{k} f_i}{\sum_{i=1}^{k} \frac{f_i}{x_i}},$$

$$H = \frac{f_1 + f_2 + \cdots + f_k}{\frac{1}{x_{s_1}} f_1 + \frac{1}{x_{s_2}} f_2 + \cdots + \frac{1}{x_{s_k}} f_k} = \frac{\sum_{i=1}^{k} f_i}{\sum_{i=1}^{k} \frac{f_i}{x_{s_i}}},$$

$$M_o = x_d + \frac{f_m - f_{m-1}}{(f_m - f_{m-1}) + (f_m - f_{m+1})} \cdot i, M_e = x_d + \frac{\frac{N}{2} - \sum f_i}{f_{M_e}} \cdot i,$$

$$Q_1 = x_d + \frac{\frac{N}{4} - \sum f_i}{f_{Q_1}} \cdot i, Q_3 = x_d + \frac{\frac{3N}{4} - \sum f_i}{f_{Q_3}} \cdot i, I_Q = \frac{Q_3 - Q_1}{2}.$$

$$m = \frac{x_1 + x_2 + \cdots + x_N}{N} = \frac{\sum_{i=1}^{N} x_i}{N}, m = \frac{f_1 x_1 + f_2 x_2 + \cdots + f_k x_k}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_i}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_i}{N}$$

$$m = \frac{f_1 x_{s_1} + f_2 x_{s_2} + \cdots + f_k x_{s_k}}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_{s_i}}{\sum_{i=1}^{k} f_k} = \frac{\sum_{i=1}^{k} f_i x_{s_i}}{N}$$

$$m = \frac{N_1 m_1 + N_2 m_2}{N_1 + N_2}.$$

$$G = \sqrt[N]{x_1 \cdot x_2 \cdot \cdots \cdot x_N} = \sqrt[N]{\prod_{i=1}^{N} x_i}, G = \sqrt[N]{x_1^{f_1} \cdot x_2^{f_2} \cdot \ldots \cdot x_k^{f_k}}, G = \sqrt[N]{x_{s_1}^{f_1} \cdot x_{s_2}^{f_2} \cdot \ldots \cdot x_{s_k}^{f_k}}$$

$$H = \frac{N}{\frac{1}{x_1} + \frac{1}{x_2} + \cdots + \frac{1}{x_N}} = \frac{N}{\sum_{i=1}^{N} \frac{1}{x_i}}, H = \frac{f_1 + f_2 + \cdots + f_k}{\frac{1}{x_1} f_1 + \frac{1}{x_2} f_2 + \cdots + \frac{1}{x_k} f_k} = \frac{\sum_{i=1}^{k} f_i}{\sum_{i=1}^{k} \frac{f_i}{x_i}},$$

$$H = \frac{f_1 + f_2 + \cdots + f_k}{\frac{1}{x_{s_1}} f_1 + \frac{1}{x_{s_2}} f_2 + \cdots + \frac{1}{x_{s_k}} f_k} = \frac{\sum_{i=1}^{k} f_i}{\sum_{i=1}^{k} \frac{f_i}{x_{s_i}}},$$

$$M_o = x_d + \frac{f_m - f_{m-1}}{(f_m - f_{m-1}) + (f_m - f_{m+1})} \cdot i,\ M_e = x_d + \frac{\frac{N}{2} - \sum f_i}{f_{M_e}} \cdot i,$$

$$Q_1 = x_d + \frac{\frac{N}{4} - \sum f_i}{f_{Q_1}} \cdot i, Q_3 = x_d + \frac{\frac{3N}{4} - \sum f_i}{f_{Q_3}} \cdot i, I_Q = \frac{Q_3 - Q_1}{2}.$$

$F_X(x) = P(\{X < x\})$, za svako $x \in \mathbb{R}$, $\qquad F_X(S) = \sum_{x_k \in S} p(x_k)$,

$$F_X(x) = \begin{cases} 0, & za \quad x \le x_1, \\ p_1, & za \quad x_1 < x \le x_2 \\ p_1 + p_2, & za \quad x_2 < x \le x_3 \\ p_1 + p_2 + p_3, & za \quad x_3 < x \le x_4 \\ \ldots & \ldots \quad \ldots \\ 1, & za \quad x > x_n. \end{cases}$$

$$X:\begin{pmatrix} x_1 & x_2 & x_3 & \dots \\ p(x_1) & p(x_2) & p(x_3) & \dots \end{pmatrix}$$

$$F_X([a,b)) = P\{a \le X < b\} = \int_a^b \varphi(x)\,dx. \quad F(x) = \int_{-\infty}^{x} \varphi(u)\,du, \ -\infty < x < +\infty$$

$$F_X(x) = P(\{X < x\}) = P(\{-\infty < X < x\}) = \int_{-\infty}^{x} \varphi(u)du\,, \qquad \int_{-\infty}^{+\infty} \varphi(x)dx = 1.$$

$$P\big(\{X = x_i\}\big|\{Y = y_j\}\big) = p\big(x_i\big|y_j\big) = \frac{P\big(\{X = x_i\} \cap \{Y = y_j\}\big)}{P\{Y = y_j\}} = \frac{p(x_i, y_j)}{q(y_j)},$$

$$q\big(y_j\big|x_i\big) = \frac{p(x_i, y_j)}{p(x_i)}, \text{za } j = 1,2,3, \dots$$

$$\varphi(y|x) = \frac{\varphi(x,y)}{\varphi_X(x)}, (\varphi_X(x) > 0), \qquad \varphi(x|y) = \frac{\varphi(x,y)}{\varphi_Y(y)}, (\varphi_Y(y) > 0),$$

$$\varphi(x,y) = \varphi(y|x) \cdot \varphi_X(x) = \ \varphi(x|y) \cdot \varphi_Y(y)$$

$$P\big(\{X = x_i\}\big|\{Y = y_j\}\big) = p\big(x_i\big|y_j\big) = \frac{P\big(\{X = x_i\} \cap \{Y = y_j\}\big)}{P\{Y = y_j\}} = \frac{p(x_i, y_j)}{q(y_j)},$$

$$q\big(y_j\big|x_i\big) = \frac{p(x_i, y_j)}{p(x_i)}, \text{za } j = 1,2,3, \dots$$

$$\varphi(y|x) = \frac{\varphi(x,y)}{\varphi_X(x)}, (\varphi_X(x) > 0), \qquad \varphi(x|y) = \frac{\varphi(x,y)}{\varphi_Y(y)}, (\varphi_Y(y) > 0),$$

$$\varphi(x,y) = \varphi(y|x) \cdot \varphi_X(x) = \ \varphi(x|y) \cdot \varphi_Y(y)$$

$$E(X) = \sum_k x_k \cdot p(x_k) = x_1 \cdot p(x_1) + x_2 \cdot p(x_2) + x_3 \cdot p(x_3) + \cdots$$

$$E(X) = \int_{-\infty}^{+\infty} x\,\varphi(x)dx.$$

$$F(\mathrm{M_e}) = 0.5. \quad P(\{X < M_e\}) \le \tfrac{1}{2} \le P(\{M_e \le X\}). \qquad P(\{X \le M_e\}) = \tfrac{1}{2},$$

$$\sigma^2(X) = \textstyle\sum_{i=1}^{n} x_i^2\, p(x_i) - \sum_{i=1}^{n} x_i \cdot p(x_i). \qquad \sigma^2(X) = \int_{-\infty}^{+\infty} (x - E(X))^2 \varphi(x)dx.$$

$$C_r^n = \binom{n}{r}$$

$$P(\bar{A}) = 1 - P(A), \quad P(A \cup B) = P(A) + P(B) - P(AB), \quad P(\sum_{i=1}^{n} A_n) = \sum_{i=1}^{n} P(A_n).$$

$$F_X(x) = P(\{X < x\}),$$

$$F_X(S) = \sum_{x_k \in S} p(x_k),$$

$$F_X(x) = \begin{cases} 0, & za \quad x \le x_1, \\ p_1, & za \quad x_1 < x \le x_2 \\ p_1 + p_2, & za \quad x_2 < x \le x_3 \\ p_1 + p_2 + p_3, & za \quad x_3 < x \le x_4 \\ \dots & \dots \quad \dots \\ 1, & za \quad x > x_n. \end{cases}$$

$$X : \begin{pmatrix} x_1 & x_2 & x_3 & \dots \\ p(x_1) & p(x_2) & p(x_3) & \dots \end{pmatrix}$$

$$F_X([a,b)) = P\{a \le X < b\} = \int_a^b \varphi(x)\,dx.$$

$$F(x) = \int_{-\infty}^{x} \varphi(u)\,du, \ -\infty < x < +\infty.$$

$$F_X(x) = P(\{X < x\}) = P(\{-\infty < X < x\}) = \int_{-\infty}^{x} \varphi(u)du, \quad \int_{-\infty}^{+\infty} \varphi(x)dx = 1.$$

Intervali poverenja

$$\left(\bar{x} - z\frac{\delta}{\sqrt{n}}, \bar{x} + z\frac{\delta}{\sqrt{n}}\right) \quad z = NORMSINV(1 - \frac{\alpha}{2})$$

$$\left(\bar{x} - t\frac{s}{\sqrt{n}}, \bar{x} + t\frac{s}{\sqrt{n}}\right) \quad t = TINV(\alpha, df) \quad df = n - 1$$

Testiranje hipoteza

$$Z_s = \frac{\overline{x} - \mu}{\frac{\delta}{\sqrt{n}}} \qquad T_s = \frac{\overline{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$z = NORMSINV(1 - \frac{\alpha}{2})$ ili $z = NORMSINV(1 - \alpha)$

$t = TINV(\alpha, df) \quad df = n - 1$ ili $t = TINV(2\alpha, df) \quad df = n - 1$

Koeficijent kolrelacije

$$T_s = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad TDIST = (|T_s|, df, 2) \quad df = n - 2$$

$$b = \frac{n \cdot \sum_{i=1}^{n}(x_i \cdot y_i) - \left(\sum_{i=1}^{n} x_i\right) \cdot \left(\sum_{i=1}^{n} y_i\right)}{n \cdot \sum_{i=1}^{n} x_i^2 - \left(\sum_{i=1}^{n} x_i\right)^2},$$

$$a = \overline{y} - b \cdot \overline{x},$$