GOVERNMENT OF KARANATAKA

KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD

II PU Statistics Scheme of Valuation March-2023

Q. No.	**SECTION - A**		Marks
I. 1	c) Demography		1
2	d) 170		1
3	b) Mean > Variance		1
4	a) Point estimation		1
5	a) Equal to m + n -1		1
II. 6	a) Method of collecting vital statistics	iv) Census enumeration	1
	b) $P_{01} \times P_{10}$	i) Time reversal test	1
	c) $Z_1^2 + Z_2^2$	v) Chi-square	1
	d) Function of sample values	ii) Statistic	1
	e) Model-II	iii) Shortages are allowed	1
III.7	Geometric mean		1
8	5		1
9	Sample mean		1
10	Chance causes		1
11	First quadrant		1
IV.12	Size of the cohort is radix		1
13	Current year price (p_1)		1
14	Historigram		1
15	0		1
16	$\sum a_i \neq \sum b_j$ (The sum of availability is not equals to the sum of requirement)		1

SECTION– B

V.17	Base period should be economically stable. The base period should not be too distant from the given period.	1 1
18	$\sum(Y-\hat{Y}) = 0$ and $\sum(Y-\hat{Y})^2$ is the least.	1+1
19	Interpolation is the technique of estimating the value of the dependent variable(Y) for any intermediate value of the independent variable(X). Extrapolation is the technique of estimating the value of Y for any value of X which is outside the range of the given series.	1 1
20	X : 0 1 : Total p(x): 3/5 2/5 : 1	1 1
21	$S.E(p) = \frac{\sigma}{\sqrt{n}} = 2$	1+1
22	The error that occurs by rejecting null hypothesis when it is actually true is called *Type I Error.* The error that occurs by accepting null hypothesis when it is actually not true is called *Type II Error.*	1 1
23	LCL = $\overline{X}' - A\sigma' = 25 - 1.5\,(2) = 22$	1+1
24	$Q^0 = \sqrt{\frac{2C_3R}{C_1}} = \sqrt{\frac{2(50)(200)}{2}} = 100$ units/cycle.	1+1

SECTION – C

VI.25	WSFR formula or $\frac{320}{8000} \times 1000$: 40, 60, 90, 100, 69, 30, 11 : 400 GRR = i $\sum$WSFR = 5 × 400 = 2000.	1+2 1+1
26	$P = \frac{p_1}{p_0} \times 100$ or $\frac{25}{20} \times 100$: 125, 120, 83.33, 80 : Total Log P : 2.0969 2.0792 1.9208 1.9031 : 8 Formula, Ans = 100	1+1 1 1+1
27	Consumer price index number is the index number of the cost met by a specified class of consumers in buying a 'basket of goods and services'. 1. Defining purpose and scope. 2. Conducting family budget enquiry and selecting the weights. 3. Obtaining price quotations. 4. Computing the index numbers.	1 1 1 1 1
28	Year(Position):2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 3Y.M.Sums : - 96 102 117 126 135 144 144 153 - Trend values : - 32 34 39 42 45 48 48 51 **Upward/Increasing trend**	1 2 1+1
29	Formula + Substitution + Ans ($y_4 - 4y_3 + 6y_2 - 4y_1 + y_0 = 0 \Rightarrow y_2 = 28$) Formula + Ans ($y_5 - 4y_4 + 6y_3 - 4y_2 + y_1 = 0 \Rightarrow y_5 = 70$)	1+1+1 1+1
30	$\lambda = 2$, $p(x) = \frac{e^{-\lambda}\lambda^x}{x!}$, X = 0, 1, 2, … (i) $p(x = 2) = \frac{e^{-2}2^2}{2!} = 0.2706$ (ii) $p(x \le 1) = p(0) + p(1) = e^{-\lambda} + 2\, e^{-\lambda} = 0.4059$	1 1+1 1+1
31	Mean = $\frac{na}{a+b} = 2$ Variance = $\frac{nab(a+b-n)}{(a+b)^2(a+b-1)} = 0.5454$	1+1 1+1+1
32	H_0: There no significant difference between mean weight of boys and girls $(\mu_1 = \mu_2)$ and $H_1: \mu_1 \ne \mu_2$ Test Statistic, $Z_{cal} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}} = \frac{50-54}{\sqrt{\frac{(8)^2}{64} + \frac{(12)^2}{48}}} = -2$ $k = \mp 2.58$ Here, Z_{cal} lies in acceptance region. ∴Accept H_0 i.e., $\mu_1 = \mu_2$	1 1+1+1 1
33	H_0: The average blood sugar is 120 ($\mu = 120$) and H_1: $\mu < 120$. Test statistic $t_{cal} = \frac{\bar{x} - \mu}{s/\sqrt{n-1}} = -6$ d.f =16, -k = -2.58, Here, t_{cal} lies in rejection region. ∴ reject H_0 i.e. $\mu < 120$	1 1+1 1+1
34	$\bar{c} = \frac{\sum c}{k} = \frac{80}{20} = 4$, CL = $\bar{c}$ = 4 U.C.L = $\bar{c} + 3\sqrt{\bar{c}} = 4 + 3\sqrt{4} = 4 + 6 = 10$ L.C.L = $\bar{c} - 3\sqrt{\bar{c}} = 4 - 3\sqrt{4} = 4 - 6 = -2 \cong 0$	1 1+1 1+1
35	Co-ordinates: (0, 9), (6, 0) and (0, 4), (3, 0) Drawing two lines. Identification of FR and its corner points: A(0, 9), B(6, 0), C(0, 4), D(3, 0) Values of objective function : $Z_A = 72$, $Z_B = 30$, $Z_C = 32$, $Z_D = 15$ Optimum(minimum) value is 15 and optimum solution is C(3, 0) *For visually challenged students: Steps of solving LPP*	2 1 1 1 *5*
36	B_1 dominates B_2, B_3, B_4. Writing remaining pay matrix. In the remaining pay off matrix A_2 dominates A_1, A_3, A_4 Best strategies are A_2, B_1 ∴ The value of the game 7	1+1 1 1 1

SECTION - D

VII.37	ASDR formula / showing one calculation A : 17, 6, 13, 43 PA : 102000, 72000, 104000, 172000 : $\sum PA = 4{,}50{,}000$ B : 20, 3, 13, 40 PB : 120000, 36000, 104000, 160000 : $\sum PB = 4{,}20{,}000$ $\sum P = 30{,}000$, STDR formula STDR(A) = 15, STDR(B) = 14. Comment : Town B is healthier.	1 1 1 1 1 1+1 1+1+1
38	p_1q_0: 60, 144, 12, 12 : $\sum p_1q_0 = 228$ p_0q_0: 50, 120, 18, 12 : $\sum p_0q_0 = 200$ p_1q_1: 48, 126, 20, 15 : $\sum p_1q_1 = 209$ p_0q_1: 40, 105, 30, 15 : $\sum p_0q_1 = 190$ $P_{01}^{L} = \frac{\sum p_1q_0}{\sum p_0q_0} \times 100 = 114$, $P_{01}^{P} = \frac{\sum p_1q_1}{\sum p_0q_1} \times 100 = 110$, $P_{01}^{DB} = \frac{P_{01}^{L}+P_{01}^{P}}{2} = 112$	1 1 1 1 2+2+2
39	x Y : -100 -30 0 30 120 : $\sum xY = 20$ x^2Y: 200 30 0 30 240 : $\sum x^2 Y = 500$ $\sum Y = 180$, $\sum x = 0$, $\sum x^2 = 10$, $\sum x^4 = 34$, n= 5 $b = \frac{\sum xY}{\sum x^2} = \frac{20}{10} = 2$ $\sum Y = na + c\sum x^2$ and $\sum x^2Y = a\sum x^2 + c\sum x^4 \Rightarrow c = 10$ and a = 16 ∴ The trend line is, $\hat{Y} = 16 + 2x + 10x^2$, $\hat{Y}_{2022} = 112$	Table-4 1 1+1+1 1+1
40. a)	N = 256, n = 5, p= 0.5 ⇒ q = 0.5 $P(x) = nC_x(p)^x(q)^{n-x}$, T(0) = N ×P(0) = 256 × q^n = 256 × $(0.5)^5$= 8 Remaining freqs are calculated by: $T(x) = \frac{n+1-x}{x}\frac{p}{q}T(x+1)$; Freqs: 8, 40, 80, 80, 40, 8	1 1+1 2
40. b)	H_0: Die is fair (i.e., E_i = 20) and H_1: Die is not fair. Test Statistic, $\chi^2 = \sum \frac{(O_i-E_i)^2}{E_i} = 10.8$ Here, k_2 =11.1 Here, $\chi^2 < k_2$ ∴ Accept H_0 i.e., Die is fair.	1+1 1+1 1

SECTION - E

VIII.41	$\mu = 55, \sigma = 3$, $Z \left(= \frac{x-55}{3}\right)$ is a SNV $P\left(\frac{46-55}{3} \leq \frac{x-\mu}{\sigma} \leq \frac{64-55}{3}\right)$ = P(-3 < Z < 3) = 0.9987 - 0.0013 = 0.9974 N P(x) =1000 (0.9974) = 997.4	1 1+1+1 1
42	H_0: P = 0.1 and H_1: P > 0.1 Here, $p = \frac{x}{n} = \frac{13}{100} = 1.3$ and Test statistic $Z_{cal} = \frac{p-P}{\sqrt{PQ/n}} = 1$ k = 1.65 Here, Z_{cal} lies in acceptance region. ∴ Accept H_0 i.e., Proportions of students wearing spectacles is 0.1	1 1+1+1 1
43	H_0: The attributes smoking and literacy are independent. H_1: The attributes smoking and literacy are not independent. $\chi^2_{cal} = \frac{N(ad-bc)^2}{(a+b)(c+d)(a+c)(b+d)} = \frac{50(7\times12-18\times13)^2}{25\times25\times20\times30} = 3$ k_2= 6.65 $\chi^2_{cal} < k_2$ ∴ accept H_0, The attributes smoking and literacy are independent.	1 1+1+1 1
44	$P - S_n$: 4000, 5000, 5600, 6200, 6600, 7000 $\sum C_i$: 1500, 3100, 4900, 7000, 9500, 12500 T_n : 5500, 8100, 10500, 13200, 16100, 19500 A(n) : 5500, 4050, 3500, 3300, **3220**, 3250 Minimum annual average cost = Rs. 3220, Optimal replacement period is 5th year.	1 1 1 1 1