GOVERNMENT OF KARANATAKA

DEPARTMENT OF PRE-UNIVERSITY EDUCTION

II PU Statistics Scheme of Valuation March-2017 **NS**

Q. No.	**SECTION - A**	Marks
1	Fertility refers to the births occurring to women of child bearing age	1
2	No	1
3	Retail /Consumers' price	1
4	An increase in employment during harvest season in agriculture sector (Any such related example)	1
5	Poisson distribution	1
6	0 (Zero)	1
7	If a single value is proposed as an estimate of the unknown parameter, then it is point estimation	1
8	The probability of rejecting H_0, when it is not true is called power of a test	1
9	When the expected frequencies are less than 5	1
10	A defect is a quality characteristic which does not conform to specifications	1
11	The item that has become inefficient with passage of time (Any other need)	1
12	It is a physical stock of goods kept for the purpose of future use	1

SECTION - B

13	It used by life insurance companies to determine the rates of premium for policies of persons of different ages. It is used by the government in planning health care, retirement age etc,. It is used for estimating the future population.(Any such related 2 uses)	1+1
14	It is based on GM. It satisfies both TRT and FRT. It is free of bias. (Any two)	1+1
15	$P_{01}^{K} = \frac{\sum p_1 q}{\sum p_0 q} \times 100 = \frac{600}{500} \times 100 = 120$	1+1
16	Prosperity, Recession, Depression and Recovery.	2
17	There are no sudden jumps in the values of dependent variable from one period to another. There will be no consecutive missing values in the series.	1+1
18	$p^x q^{1-x} = 0.4^x 0.6^{1-x}$, X = 0, 1	1+1
19	Chi-square distribution with 2 df. Mean = n = 2	1+1
20	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
21	$\chi^2_{cal} = \frac{n s^2}{\sigma^2} = \frac{10 \times 20}{25} = 8$	1+1
22	Controlling the quality of the goods, during the manufacturing process itself is called process control. The process of inspection of manufactured lot for acceptability is called product control.	1 1
23	$A_n = \frac{P - S_n + \sum c_i}{n} = \frac{10000 + 10400}{3} = \text{Rs. } 6800$	1+1
24	$Q^0 = \sqrt{\frac{2C_3 R}{C_1}} = \sqrt{\frac{2(50)(3600)}{4}} = 300 \text{ units/year}$	1+1

SECTION - C

25	ASDR formula or $\frac{68}{4000} \times 1000$: 17, 6, 13, 43 : Total PA : 102000, 72000, 104000, 172000 : 4,50,000 STDR formula and Ans : 15 (Here, $\sum P = 30,000$)	1+1 1 1+1
26	1) Defining (stating) the purpose of the index number. 2) Selection of base period. 3) Selection of commodities. 4) Obtaining price quotations. 5) Choice of an average. 6) Selection of weights. 7) Selection of suitable formula. (Any five)	5 (1 each)
27	$P = \frac{p_1}{p_0} \times 100$ or $\frac{3000}{2000} \times 100$: 150, 75, 125, 80, 120 : Total WP : 4500, 600, 1500, 1200, 3000 : 10800 Formula, Ans = 120	1+1 1 1+1
28	Year (Position): 2008 2009 2010 2011 2012 2013 2014 2015 2016 5Y.M.Sums : 500 560 530 590 645 Trend values : 100 112 106 118 129	1 2 2
29	Formula + Substitution + Ans ($y_4 - 4y_3 + 6y_2 - 4y_1 + y_0 = 0 \Rightarrow y_2 = 1771$) Formula + Ans ($y_5 - 4y_4 + 6y_3 - 4y_2 + y_1 = 0 \Rightarrow y_5 = 2551$)	1+1+1 1+1
30	$\lambda = 2$, $p(x) = \frac{e^{-\lambda}\lambda^x}{x!}$ (i) $p(2) = \frac{e^{-2}\,2^2}{2!} = 0.2706$ (ii) $p(x \le 1) = p(0) + p(1) = e^{-\lambda} + e^{-\lambda}2 = 0.4059$	1 1+1 1+1
31	Given: a = 8, b = 4, n = 5 and x = 3 Prob $= \frac{{}^{a}C_x \times {}^{b}C_{n-x}}{{}^{a+b}C_n} = \frac{{}^{8}C_3 \times {}^{4}C_2}{{}^{12}C_5} = \frac{56 \times 6}{792} = 0.4242$	1 1+1+1+1
32	H_0: The Mean weight of boys and girls are equal ($\mu_1 = \mu_2$) and H_1: $\mu_1 < \mu_2$ 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 = - 1.65 Here, Z_{cal} lies in rejection region. ∴ Reject H_0	1 1+1+1 1
33	H_0: The average life of tyres is 40000 km ($\mu_1 = \mu_2$) and H_1: $\mu_1 \neq \mu_2$. Test statistic $t_{cal} = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 2.5$ d.f = 9, -k = -3.25, k = 3.25, Here, t_{cal} lies in acceptance region. ∴ accept H_0	1 1+1 1+1
34	$\bar{\bar{X}} = \frac{\sum \bar{X}}{k} = \frac{300}{6} = 50 =$ CL ; $\bar{R} = \frac{\sum R}{k} = \frac{30}{6} = 5$ U.C.L = $\bar{\bar{X}} + A_2\bar{R}$ = 50 + 0.729 × 5 = 53.645 L.C.L = $\bar{\bar{X}} - A_2\bar{R}$ = 50 - 0.729 × 5 = 46.355	1 1+1 1+1
35	Co-ordinates: (0, 12), (18, 0) and (0, 10), (20, 0) Drawing two lines. Identification of FR and its corner points: O(0, 0), A(0, 10), B(12, 4), C(18, 0) Objective function values : $Z_O = 0$, $Z_A = 1700$, $Z_B = 1880$, $Z_C = 1800$ Optimum value is 1880 and optimum solution is B(12, 4) *For visually challenged students: Formulated LPP of Q No. 35*	2 1 1 1 5
36	All payoffs of B_1 < B_2, B_3 ∴ B_1 dominates B_2 and B_3 All payoffs of A_2 > A_1, A_3 and A_4 ∴ A_2 dominates A_1, A_3 and A_4 The best strategies are A_2 and B_1. The value of the game is 7	1 1 2+1

SECTION - D

37	WSFR formula	1
	WSFR : 20, 40, 60, 40, 30, 20, 10 : 220	2
	WSFR × S : 18.2, 36, 53.4, 35.2, 26.1, 17.2, 8.5 : 194.6	2
	GRR = i ∑WSFR = 1100.	1+1
	NRR = i ∑WSFR × S = 973.	1+1
	Population decreases	1
38	p_0q_0: 50, 120, 18, 12 : $\sum p_0q_0 = 200$	1
	p_0q_1: 40, 105, 30, 15 : $\sum p_0q_1 = 190$	1
	p_1q_0: 60, 144, 12, 12 : $\sum p_1q_0 = 228$	1
	p_1q_1: 48, 126, 20, 15 : $\sum p_1q_1 = 209$	1
	$P_{01}^{L} = \frac{\sum p_1q_0}{\sum p_0q_0} \times 100 = 114$, $P_{01}^{P} = \frac{\sum p_1q_1}{\sum p_0q_1} \times 100 = 110$, $P_{01}^{DB} = \frac{P_{01}^{L} + P_{01}^{P}}{2} = 112$	2+2+2
39	x : -3 -2 -1 0 1 2 3 : Total	
	xY: -237 -166 -90 0 90 190 297 : 84	
	n = 7, ∑Y = 630, ∑x = 0, $\sum x^2 = 28$ and ∑xY = 84	2
	$a = \frac{\sum Y}{n} = 90$, $b = \frac{\sum xY}{\sum x^2} = 3$	2 + 2
	∴ The trend line is, $\hat{Y} = 90 + 3x$	1
	Trend values: 81 84 87 90 93 96 99	2
	$\hat{Y}_{2017}$ = 102 tons	1
40	a) Given: n = 5, p = 0.5, N = 128	1
	p(0) = 1/32 or $T_0 = 4$	1
	Theoretical frequencies: 4, 20, 40, 40, 20, 4	3
	b) $E_i = 10$	1
	H_0: Accidents occur uniformly H_1: Accidents does't occur uniformly	1
	Test Statistic, $\chi^2_{cal} = \sum \frac{(O_i - E_i)^2}{E_i} = 6.8$	1+1
	Here, $\chi^2 < k_2$ ∴ Accept H_0 i.e., Accidents occur uniformly.	1

SECTION - E

41	i) $P(X > 105) = P\left(\frac{x-\mu}{\sigma} > \frac{105-100}{5}\right) = P(Z > 1) = 0.1587$	1+1
	ii) P(-2 < Z < 2) = 0.9772 - 0.0228 = 0.9544	1+1+1
42	H_0: Both tea and coffee are equally popular (P = 0.5) and H_1: P≠ 0.5	1
	Here, $p = \frac{x}{n} = \frac{220}{400} = 0.55$ and Test statistic $Z_{cal} = \frac{p-P}{\sqrt{PQ \div n}} = 2$	1+1+1
	- k = - 1.96 and k = 1.96. Here, Z_{cal} lies in rejection region. ∴ reject H_0	1
43	H_0: Smoking and literacy are independent	
	H_1: Smoking and literacy are not independent	1
	$\chi^2_{cal} = \frac{N(ad-bc)^2}{(a+b)(c+d)(a+c)(b+d)} = \frac{100(20 \times 20 - 30 \times 30)^2}{50 \times 50 \times 50 \times 50} = 4$	1+1+1
	$k_2 = 6.65$ $\chi^2_{cal} < k_2$ ∴ Accept H_0, Smoking and literacy are independent	1
44	$X_{11} = 400$, $X_{12} = 100$, $X_{22} = 100$, $X_{23} = 100$, $X_{33} = 100$.	2
	T C = $\sum C_{ij}X_{ij}$ = 8(400) + 4(100) + 5(100) + 6(100) + 3(100) = 5000	2
	No [It is non-degenerate solution, ∵ No. of allocations = 5 = m+n-1]	1

END PAGE.