GOVERNMENT OF KARANATAKA

DEPARTMENT OF PRE-UNIVERSITY EDUCATION

II PU Statistics Scheme of Valuation July-2017

31

NS

Q. No.	SECTION - A	Marks
1	Fecundity refers to "the capacity of a woman to bear children".	1
2	Index numbers study the effect of factors that cannot be measured directly. (Any such related characteristics)	1
3	Geometric mean.	1
4	A graphical presentation of time series data is called historigram.	1
5	Variance = pq = $0.2 \times 0.8 = 0.16$	1
6	$P(Z > k) = 0.05 \Rightarrow k = 1.64$	1
7	Any statistic which is used to estimate an unknown parameter is called an estimator.	1
8	A statistic based on whose distribution the testing of hypothesis is conducted is called test statistic.	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	Because of non-negativity restrictions.	1
12	Number of competitors must be finite. (Any Such Related property)	1

SECTION – B

13	$e_0 = \frac{T_0}{l_0} = \frac{6500000}{100000} = 65$	1+1
14	Base period should be economically stable. The base period should not be too distant from the current period.	1 1
15	$Q_{01}^{L} = \frac{\sum q_1 p_0}{\sum q_0 p_0} \times 100 = \frac{1125}{1250} \times 100 = 90$	1+1
16	The regular, periodic and short term variation in a time series is called seasonal variation. Umbrellas are sold more in rainy season (A S R Example)	1+1
17	(i)There are no sudden jumps in the values of dependent variable from one period to another.(ii)There will be no consecutive missing values in the series.	1+1
18	Range: X = 0, 1, ... , min(a, n) = 0, 1, ... , min(4, 5) = 0, 1, 2, 3, 4 Mean $= \frac{na}{a+b} = \frac{5 \times 4}{4+6} = \frac{20}{10} = 2$	1 1
19	Median = 9.34, Mode = n - 2 = 10 – 2 = 8	1+1
20	The probability of rejecting H_0, when it is true is called size of the test. The probability of rejecting H_0, when it is not true is called power of a test.	1 1
21	To test whether population has a given variance. To test goodness of fit of theoretical frequencies to observed frequencies.	1 1
22	It is used when the items are of destructive in nature. It is less expensive, as 100% inspection is more expensive.	1 1
23	The value of Z at (12, 10) is 100 and the value of Z at (14, 5) is 90 The solution (14, 5) minimizes the objective function Z = 5X + 4Y	1 1
24	Row minima: 2, 5 Column maxima: 5, 8 Maximin: 5 and Minimax: 5 ∴ The value of the game 5	1 1

SECTION – C

25	WSFR formula or $\frac{390}{13000} \times 1000$: 30, 50, 60, 50, 40, 24, 6 : 260 GRR = i $\sum$WSFR = 5 × 260 = 1300.	1+2 1+1
26	p_0q: 70, 88, 100, 96 : $\sum p_0q = 354$ p_1q: 75, 96, 120, 120: $\sum p_1q = 411$ $P_{01}^K = \frac{\sum p_1q}{\sum p_0q} \times 100 = 116.1$, There is 16.1% increase in the price of items in the current year.	1 1 1+1 1
27	$P = \frac{p_1}{p_0} \times 100$ or $\frac{2500}{2000} \times 100$: 125, 150, 120, 80, 125 : Total WP : 1250, 600, 1440, 640, 750 : 4680 Formula, Ans = 117	1+1 1 1+1
28	Year (**Position**) : 2005 2006 2007 2008 2009 2010 Semi Averages: - 110 - - 120 - Graph	1 2 2
29	$\Delta_0^1 = 10$, $\Delta_0^2 = 5$, $\Delta_0^3 = 0$ x = (30 – 25) / 10 = 0.5, Formula and Answer = 9.375	2 1+1+1
30	p = 35% = 0.35, n = 5, $P(x) = {}^nC_x(p)^x(q)^{n-x}$; x = 0, 1, ...n (i) $P(x = 2) = {}^5C_2(0.35)^2(0.65)^3 = 0.3364$ (ii) $P(x \geq 1) = 1 - [P(0)] = 1 - [0.1160] = 0.8840$	1 1+1 1+1
31	The normal curve is symmetrical about the mean ($\beta_1 = 0$). The distribution is mesokurtic ($\beta_2 = 3$). The total area under the curve is unity. The quartiles Q_1 and Q_3 are equidistant from the median. i.e., $Q_2 = (Q_3+Q_1)/2$ S.D = σ, Q. D = $2\sigma/3$, M. D = $4\sigma/5$ (Any such related property)	5 (1 each)
32	H_0: Survey does not support the leader's claim and H_1: P > 0.36 Here, n= 400, p = 0.42, Q = 0.64 and Test statistic $Z_{cal} = \frac{p-P}{\sqrt{PQ/n}} = 2.5$ k = 1.65 Here, Z_{cal} lies in rejection region. ∴ reject H_0	1 1+1+1 1
33	H_0: Results and family conditions are independent H_1: Results and family conditions are not independent $\chi^2_{cal} = \frac{N(ad-bc)^2}{(a+b)(c+d)(a+c)(b+d)} = \frac{100(30 \times 20 - 10 \times 40)^2}{40 \times 60 \times 70 \times 30} = 0.7937$ $k_2 = 6.65$ $\chi^2_{cal} < k_2$ ∴ Accept H_0, Results and family conditions are independent	1 1+1+1 1
34	$\bar{R} = \frac{\sum R}{k} = \frac{30}{6} = 5 = CL$ L.C.L = $D_3\bar{R} = 0\ (5) = 0$ U.C.L = $D_4\bar{R} = 2.282\ (5) = 11.41$	1 1+1 1+1
35	$X_{11} = 400$, $X_{12} = 100$, $X_{22} = 200$, $X_{23} = 100$, $X_{33} = 200$. T C = $\sum C_{ij}X_{ij}$ = 8(400) + 4(100) + 5(200) + 6(100) + 3(200) = 5800	3 2
36	P – S_n: 2000, 2500, 3000, 3500, 4000 $\sum C_i$: 100, 300, 630, 1140, 2000 T_n : 2100, 2800, 3630, 4640, 6000 A(n) : 2100, 1400, 1210, **1160**, 1200 Minimum annual average cost = Rs. 1160, Optimal replacement period is 4th year.	1 1 1 1 1

SECTION - D

37	ASDR formula or $\frac{200}{8000} \times 1000 = 25$	1
	A : 25, 4, 5, 36	1
	PA : 125000, 48000, 75000, 288000 : 536000	1
	$\sum P = 40000 = P$	1
	STDR formula, STDR(A) = 13.4	1+1
	For Locality B: CDR = STDR, CDR formula, Ans: 12.25 OR	1+1+1
	(B:20, 5, 6, 30; PB:100000, 60000, 90000, 240000: 490000 Ans:12.25)	
	Town B is healthier.	1
38	p_0q_0: 300, 200, 240, 300, 320 : $\sum p_0q_0 = 1360$	1
	p_0q_1: 336, 240, 240, 240, 288 : $\sum p_0q_1 = 1344$	1
	p_1q_0: 500, 200, 360, 360, 480 : $\sum p_1q_0 = 1900$	1
	p_1q_1: 560, 240, 360, 288, 432 : $\sum p_1q_1 = 1880$	1
	$P_{01}^{L} = \frac{\sum p_1q_0}{\sum p_0q_0} \times 100 = 139.71$, $P_{01}^{P} = \frac{\sum p_1q_1}{\sum p_0q_1} \times 100 = 139.88$	2 + 2
	$P_{01}^{F} = \sqrt{P_{01}^{L} \times P_{01}^{P}} = 139.7949$	2
39	x : -3 -2 -1 0 1 2 3 : Total	
	xY: -150 -94 -52 0 48 110 180 : 42	
	n = 7, $\sum Y = 357$, $\sum x = 0$, $\sum x^2 = 28$ and $\sum xY = 42$	2
	$a = \frac{\sum Y}{n} = 51$, $b = \frac{\sum xY}{\sum x^2} = 1.5$	2 + 2
	$\therefore$ The trend line is, $\hat{Y} = 51 + 1.5x$	1
	Trend values: 46.5, 48, 49.5, 51, 52.5, 54, 55.5	2
	$\hat{Y}_{2017} = 58.5$ (000's tons)	1
40	N = 100, $\lambda = 1.2$, $p(0) = e^{-\lambda} = e^{-1.2} = 0.3012$ or $T_0 = N \times p(0) = 30.12$	1+1
	Theoretical frequencies: 30, 36, 22, 9, 2, 1	3
	H_0: P.D is a good fit and H_1: P.D is not a good fit.	1
	Test Statistic, $\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i} = 0.5232$	1+1
	$k_2 = 5.99$, χ^2_{cal} lies in acceptance region. $\therefore$ Accept H_0 i.e., P.D is a good fit.	1+1

SECTION - E

41	i) $P(X > 90) = P\left(\frac{x-\mu}{\sigma} > \frac{90-80}{5}\right) = P(Z > 2) = 0.0228$	1+1
	ii) $P(-2 < Z < 1) = 0.9772 - 0.1587 = 0.8185$	1+1+1
42	H_0: The average life of tyres is 40000 km ($\mu = 40000$) and H_1: $\mu > 40000$.	1
	Test statistic $Z_{cal} = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{41000-40000}{5000/\sqrt{100}} = 2$	1+1+1
	k = 2.33, Here, Z_{cal} lies in acceptance region. $\therefore$ accept H_0	1
43	H_0: Training is not effective and H_1: $\mu_1 < \mu_2$.	1
	$d = x_1 - x_2$: -10, 2, -2, 4, -4 : -10 = $\sum d$	
	d^2 : 100, 4, 4, 16, 16 : 140 = $\sum d^2$	
	Here, $\bar{d} = \frac{\sum d}{n} = \frac{-10}{5} = -2$ and $s_d = \sqrt{\frac{\sum d^2}{n} - \left(\frac{\sum d}{n}\right)^2} = 4.899$	1
	Test statistic $t_{cal} = \frac{\bar{d}}{s_d/\sqrt{n-1}} = -0.8165$	1+1
	d.f = 4, k = -2.13, Here, t_{cal} lies in acceptance region. $\therefore$ accept H_0	1
44	R = 3600/year, C_3 = Rs.50, C_1 = Rs.9/year, C_2 = Rs.3/year	1
	Formula and Ans = 400 units	1+1
	Formula and Ans = Rs. 900	1+1