GOVERNMENT OF KARNATAKA
DEPARTMENT OF PRE-UNIVERSITY EDUCATION
II YEAR PUC SUPPLEMENTARY EXAMINATION – AUGUST 2022

SCHEME OF VALUATION

Subject code: 31(NS) **Subject: STATISTICS**

Q. NO.	I. SECTION – A	MARKS
1.	$P_t = P_0 + (B - D) + (I - E)$	1
2.	Expected number of years that a new born baby would live.	1
3.	Paasche's index number.	1
4.	The index number of the cost met by a specified class of consumers in buying a 'basket of goods and services'.	1
5.	Time series helps in planning and forecasting the business activities. (Any one)	1
6.	Irregular / random / erratic variation.	1
7.	Mean = 0.6	1
8.	Median = 12.34	1
9.	$-\infty < t < \infty$	1
10.	The set of all the admissible values of the parameters.	1
11.	Method of obtaining the most likely value of the parameter using statistic.	1
12.	d. f. = 1	1
13.	np – chart (d-chart) or c- chart. (Any one)	1
14.	If v = 0.	1
15.	Profit due to increasing market price. (Any one)	1

Q.NO.	II. SECTION - B	MARKS
16.	IMR = $\frac{\text{Number of deaths among infants in the year}}{\text{Total number of live births in the year}}$ x 1000 = **60**	1 1
17.	Life tables are used by life insurance companies. Life table is used for estimating the future population. (Any two)	1 1
18.	$P_{01}^{(DB)} = \frac{P_{01}(L) + P_{01}(P)}{2}$ = **250**	1 1
19.	$V_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}$ x 100 = **125**	1 1
20.	(i) Defining purpose and scope. (ii) Obtaining price quotations. (Any two)	1 1
21.	(i) Prosperity (ii) Decline (Recession) (iii) Depression (iv) improvement (Recovery)	1 1
22.	Merit: The method is mathematical and so, it is highly efficient. (Any one) Demerit: The procedure of calculation is difficult. (Any one)	1 1
23.	**Interpolation** is the technique of estimating the value of dependent variable for any intermediate value of the independent variable. **Extrapolation** is the technique of estimating the value of dependent variable for any value of the independent variable which is outside the given range.	1 1
24.	S.D. = $\sqrt{pq}$ = **0.477**	1 1
25.	Variance = 2n = **22**	1 1
26.	S.E.(p) = $\sqrt{\frac{PQ}{n}}$ = **0.05**	1 1
27.	**Null hypothesis** is the hypothesis which is being tested for a possible rejection, under the assumption that it is true. **Alternative hypothesis** is the hypothesis which is accepted when null hypothesis is rejected.	1 1
28.	L.C.L. = $\bar{c} - 3\sqrt{\bar{c}}$ = **-2**	1 1
29.	Player - A A_1 A_2 A_3 Player - B B_1 [5 3 -1] B_2 [4 2 -2]	1 1
30.	Controlled variables. Uncontrolled variables.	1 1

Q.NO.	III. SECTION – C	MARKS
31.	ASFR = $\frac{\text{Number of Live births in a specified age group in a year}}{\text{Total number of females in that particular age group in a year}}$ X 1000	1
	ASFRs : 20 120 180 125 30 8 4 Total: **487**	2
	TFR = 5 x Σ Quinquennial ASFRs	1
	= **2435**	1
32.	WSFR = $\frac{\text{No.of Female births in a specified age group in a year}}{\text{Total no.of females in that particular age group in a year}}$ x 1000	1
	WSFR: 20 30 60 40 30 20 10	1
	WSFR X S: 18 27 54 34 24 16 7 Σ WSFR X S = **180**	1
	NRR = i x Σ WSFR X S	1
	= **900**	1
33.	1. Index number simplifies the data thus facilitates comparative study. } (Any	1
	2. Index numbers are used in studying trends and tendencies. } three	1
	3. Index numbers help in measuring purchasing power of money. } Uses)	1
	1. Many formulae are used in the construction of index numbers and the different formulae give different answers. } (Any two	1
	2.While constructing index numbers , the quality of the product is not taken into consideration. } limitations)	1
34.	P = $\frac{p_1}{p_0}$ x 100	1
	P: 110 160 115 105 120	1
	WP: 3850 2400 2300 1050 2400 ΣWP = **12000**	1
	CPI = $\frac{\Sigma WP}{\Sigma W}$	1
	CPI = **120**	1
35.	3-yearly moving sums: - 120 120 129 141 150 156 165 -	2
	3-yearly moving averages: - 40 40 43 47 50 52 55 -	1
	Position of trend values.	1
	Conclusion: The given data shows upward trend.	1
36.	Table and n = 5, $\Sigma y = 515$, $\Sigma x = 0$, $\Sigma x^2 = 10$, $\Sigma xy = 179$	2
	a = $\frac{\Sigma y}{n} = \frac{515}{5}$ = **103**	1
	b = $\frac{\Sigma xy}{\Sigma x^2} = \frac{179}{10}$ = **17.9**	1
	The trend equation is, y = 103 + 17.9(x)	1
37.	5 12 19 26 - 40 -	
	(y_0) (y_1) (y_2) (y_3) (y_4) (y_5) (y_6)	1
	$(y-1)^5 = 0 \Rightarrow y_5 - 5y_4 + 10y_3 - 10y_2 + 5y_1 - y_0 = 0$	1
	y_4 = **33** tons	1
	$y_6 - 5y_5 + 10y_4 - 10y_3 + 5y_2 - y_1 = 0$	1
	y_6 = **47** tons	1
38.	$p(x) = {}^6C_x\,(0.4)^x\,(0.6)^{6-x}$, x =0,1,2,3,4,5,6	1
	a) $P(X = 3) = {}^6C_3\,(0.4)^3\,(0.6)^{6-3}$	1
	= **0.2765**	1
	b) $P(X \geq 1) = 1 - p(0) = 1 - q^n$	1
	= **0.9533**	1

39.	$P(X=2) = \frac{{}^{6}C_2 \; {}^{9}C_{4-2}}{{}^{15}C_4}$	1
	$= \mathbf{0.3956}$	1
	$S.D.(X) = \sqrt{\frac{nab(a+b-n)}{(a+b)^2(a+b-1)}}$	1
	$= \sqrt{\frac{4 \times 6 \times 9\,(11)}{225(14)}}$	1
	$= \mathbf{0.8685}$	1
40.	$H_0: \mu_1 = \mu_2$ and $H_1: \mu_1 \neq \mu_2$	1
	$Z_{cal} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$	1
	$= \mathbf{1.8488}$	1
	$k = \pm 1.96$	1
	$\therefore H_0$ is accepted.	1
41.	$H_0: \mu = 35$ and $H_1: \mu > 35$	1
	$t_{cal} = \frac{\bar{x} - \mu_0}{s/\sqrt{n-1}}$	1
	$= \mathbf{1.3333}$	1
	$k = 1.75$	1
	$\therefore H_0$ is accepted.	1
42.	$H_0: \sigma^2 = 100$ and $H_1: \sigma^2 < 100$	1
	$\chi^2_{cal} = \frac{ns^2}{\sigma_0^2}$	1
	$= \mathbf{16.2}$	1
	$k_1 = 7.63$	1
	$\therefore H_0$ is accepted.	1
43.	$CL = \bar{R} = \mathbf{6}$	1
	$LCL = D_3\bar{R}$	1
	$= \mathbf{0}$	1
	$UCL = D_4\bar{R}$	1
	$= \mathbf{13.692}$	1
44.	Co-ordinates: (0,4), (10,0) and (0,7), (7,0)	1
	Drawing two lines.	1
	Identification of F.R. and its corner points: A(0,4), B(0,7), C(5,2)	1
	Objective function values: $Z_A = 12$, $Z_B = 21$, $Z_C = 46$.	1
	Maximum value of Z = **46** and optimal solution: x = **5** & y = **2**	1
	(For visually challenged students only)	
	Steps for solving LPP graphically.	5
45.	NWCR method and $x_{11}= 80$ $x_{12} = 150$ $x_{13} = 120$ $x_{23} = 110$ $x_{33}= 100$	3
	Transportation cost = **Rs 5170**	2

Q. NO.	IV. SECTION – D	MARKS
46.	ASDR = $\frac{\text{Number of deaths in a specific age group in a year}}{\text{Total population in that age group in a year}}$ x 1000	1
	ASDR(A): 10 5 15 21	1
	ASDR(B): 11 4 12 20	1
	PA: 1,50,000 1,25,000 6,00,000 2,10,000 ΣPA = **10,85,000**	1
	PB: 1,65,000 1,00,000 4,80,000 2,00,000 ΣPB = **9,45,000**	1
	ΣP = 90,000	1
	$STDR_A = \frac{\Sigma PA}{\Sigma P}$ and $STDR_B = \frac{\Sigma PB}{\Sigma P}$	1
	STDR(A) = **12.06**	1
	STDR(B) = **10.5**	1
	Interpretation: Locality B is healthier.	1
47.	p_0q_0: 60 100 60 10 45 Σp_0q_0 = **275**	1
	p_0q_1: 100 150 90 20 30 Σp_0q_1 = **390**	1
	p_1q_0: 75 120 50 8 30 Σp_1q_0 = **283**	1
	p_1q_1: 125 180 75 16 20 Σp_1q_1 = **416**	1
	$P_{01}^{(L)} = \frac{\Sigma p_1q_0}{\Sigma p_0q_0}$ x 100	1
	= **102.9**	1
	$P_{01}^{(P)} = \frac{\Sigma p_1q_1}{\Sigma p_0q_1}$ x 100	1
	= **106.67**	1
	$P01(F) = \sqrt{P_{01}(L) \times P_{01}(P)}$	1
	= **104.77**	1
48.	p_0q_0: 50 120 10 40 Σp_0q_0 = **220**	1
	p_0q_1: 70 180 25 48 Σp_0q_1 = **323**	1
	p_1q_0: 60 126 12 40 Σp_1q_0 = **238**	1
	p_1q_1: 84 189 30 48 Σp_1q_1 = **351**	1
	$P_{01}^{(ME)} = \frac{\Sigma p_1q_0+\Sigma p_1q_1}{\Sigma p_0q_0+\Sigma p_0q_1}$ x 100	1
	$= \frac{238+351}{220+323}$ x 100 $= \frac{589}{543}$ x 100	1
	= **108.47**	1
	According to TRT, $P_{01} \times P_{10} = 1$	1
	$P_{01}^{ME} \times P_{10}^{ME} = \frac{\Sigma p_1q_0+\Sigma p_1q_1}{\Sigma p_0q_0+\Sigma p_0q_1} \times \frac{\Sigma p_0q_1+\Sigma p_0q_0}{\Sigma p_1q_1+\Sigma p_1q_0}$	1
	$= \frac{238+351}{220+323} \times \frac{323+220}{351+238} = \frac{589}{543} \times \frac{543}{589}$ = **1**	1
49.	$\Sigma x = 0$, $\Sigma x^2 = 70$, $\Sigma \log y = 6.681$, $\Sigma x \log y = 3.4336$	1+1+1+1
	$\log a = \frac{\Sigma \log y}{n}$ = **1.1135**	1+1
	$\log b = \frac{\Sigma x \log y}{\Sigma x^2}$ = **0.049**	1+1
	$\log y = 1.1135 + 0.049 x$	1
	$\hat{y}_{2021}$ = **28.61** Lakhs	1
50. a	n = 4, N = 128, p = 0.5 and q = 0.5	1
	$p(0) = q^n = 0.0625$ or $T(0) = N \times p(0) = 8$	1
	T(1) = 32 T(2) = 48 T(3) = 32 T(4) = 8	3
50. b	H_0: Poisson distribution is a good fit H_1: Poisson distribution is not a good fit	1
	$\chi^2_{cal} = \sum \frac{(O-E)^2}{E}$	1
	= **1.2432**	1
	k_2 = 5.99	1
	∴ H_0 is accepted.	1

Q. NO.	V. SECTION – E	MARKS
51.	$\mu = 80,\ \sigma = 5,\ Z = \frac{x-80}{5}$ is a S.N.V. a) $P(X > 70) = P(Z > -2)$ $= \mathbf{0.9772}$ b) $P(X < 85) = P(Z < 1)$ $= \mathbf{0.8413}$	1 1 1 1 1
52.	$H_0 : P_1 = P_2 \quad H_1 : P_1 \neq P_2$ $Z_{cal} = \frac{p_1 - p_2}{\sqrt{PQ\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$ $= \mathbf{0.789}$ $k = \pm 1.96$ $\therefore H_0$ is accepted.	1 1 1 1 1
53.	$H_0 : \mu_1 = \mu_2 \quad H_1 : \mu_1 < \mu_2$ $t_{cal} = \frac{\bar{d}}{S_d/\sqrt{n-1}}$ $= \mathbf{-1.943}$ $k = -3.75$ $\therefore H_0$ is accepted.	1 1 1 1 1
54.	$P - S_n = 5000$ ΣC_i : 200 550 1000 1600 2500 4300 T(n) : 5200 5550 6000 6600 7500 9300 A(n) : 5200 2775 2000 1650 **1500** 1550 $\therefore$ The optimum replacement period, n = **5** years.	1 1 1 1 1
55.	$R = 12000 \quad C_1 = 10 \quad C_3 = 300$ a) $Q^0 = \sqrt{\frac{2C_3R}{C_1}}$ $= \mathbf{848.52}$ units. b) $C(Q^0,S^0) = \sqrt{2C_1C_3R}$ $= \mathbf{Rs\ 8485.28}$/year.	1 1 1 1 1

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