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PG3S-433-A-23
M.A./M.Sc. III Semester (CBCS) Degree Examination
STATISTICS
Practical based on SCT 3.1 (a)
Paper : SCP 3.1

Time : 2 Hours **Maximum Marks : 30**

Instructions to Candidates:

1) *Answer any **Two** questions.*
2) *All questions carry **equal** marks.*

1. Obtain i) GRR, ii) NRR, iii) Intrinsic growth rate(r) and iv) Mean length of generation(g). for the following data.

Age	ASFR (f_x)	L_x/2.5
15-19	0.033	0.993
20-24	0.090	0.9890
25-29	0.120	0.9871
30-34	0.087	0.9850
35-39	0.032	0.9871
40-44	0.006	0.9766
45-49	0.000	0.9685

Note that l_0=10000

2. The data in the table below is related to the Malawi located in Southern Africa . The total number of urban women in the survey is 1334, and the total number of women in the survey is 10518.

i) Calculate the general fertility rates for rural and urban areas.

ii) Calculate total fertility rates for urban and rural areas.

Age group	Percentage of all women in age group		Age specific fertility rates per woman	
	Urban areas	Rural areas	Urban areas	Rural areas
15-19	9.7	9.4	0.135	0.165
20-24	10.1	7.8	0.268	0.291
25-29	9.0	6.3	0.242	0.273
30-34	6.3	5.3	0.210	0.261
35-39	4.7	4.4	0.149	0.202
40-44	3.0	4.4	0.86	0.123
45-49	1.9	3.1	0.012	0.062

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3. Compute CDR,ASDR and SDR to the following data.

Age group	Total population of state A (000)	Number of deaths	Total population of state B(000)	Number Of deaths	Standard Population
Less than 1 year	1455009	121677	---	---	---
1-4	4939526	77799	5343	82	108295814
5-9	6394277	21285	5637	21	112046601
10-14	5466041	8269	5882	7.9	99235969
15-19	4224115	8520	5473	8.1	82183256
20-24	36369540	8804	4938	8.2	74292162
25-29	3383185	10920	4470	10.1	68648579
30-34	2949337	9519	4039	9.2	59879317
35-39	4266662	9952	3683	10.0	51632723
40-44	2041649	8031	3190	8.3	43314180
45-49	1741339	10538	2652	11.4	36521457
50-54	1440803	14678	2091	15.1	29874497
55-59	11655860	21520	1616	23.2	23926018
60-64	1002189	24968	1345	26.8	20311173
65-69	725131	29622	1052	23.3	14866095
70+	974327	58530	841	51.1	21274848

4. Construct abridged life table by using Greville's method.

Age group	$_nm_x$
0-1	0.0167
1-5	0.0011
5-10	0.0005
10-15	0.0003
15-20	0.0008
20-25	0.0011
25-30	0.0012
30-35	0.0023
35-40	0.0033
40-45	0.0023
45-50	0.0046
50-55	0.0069
55-60	0.0097
60-65	0.00172
65-70	0.0252
70+	0.0828

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PG3S-429-A-23

M.A/M.Sc. III Semester(CBCS) Degree Examination

STATISTICS

(Based on HCT 3.1)

Paper - HCP-3.1

Time : 2 Hours **Maximum Marks : 30**

Instructions to Candidates:

i. Answer any TWO questions.

ii. All questions carry equal marks.

1) Consider a Markov chain with the following transition probability matrix(TPM)

$$P = \begin{bmatrix} 0 & 1 & 0 \\ 0.5 & 0 & 0.5 \\ 0 & 1 & 0 \end{bmatrix}$$

Show that the Markov chain is irreducible, periodic with period 2 and all the states of the Markov chain are persistent non-null.

2) Find the stationary distribution for the following TPM $P = \begin{bmatrix} 0 & 0.3 & 0.7 \\ 0.6 & 0 & 0.4 \\ 0.6 & 0.4 & 0 \end{bmatrix}$

3) A readymade garment shop has a stock of 500 T-Shirts. Usually it takes one month on an average for a T-Shirt to be sold. The waiting time between sales is exponential.

i) How many T-Shirts will be sold in the first 5 months?
ii) How many months will it take to sell 95% of the stock?

4) The branching process $\{X_n, n>0\}$ with $X_0=1$ has the off spring distribution given by $\{0.5,0.3,0.2\}$. Find

i) Generating function of X_2.
ii) The probability of ultimate extinction.
iii) The correlation co-efficient between (X_1, X_3)

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PG3S-436-A-23
M.A/M.Sc. III Semester (CBCS) Degree Examination
STATISTICS
(Based on OET 3.1)
Paper : OEP 3.1

Time : 2 Hours **Maximum Marks : 30**

Instructions to Candidates:

1) *Answer any **Two** questions.*
2) *All questions carry **equal** marks.*

1. a) In a city there are three stores each having 50 pieces of item. Let these stores be denoted by S1, S2, S3. The stores S1, S2 and S3 have 10%, 15% and 20% defective items, respectively. A customer first chooses a store randomly and then selects an item randomly from the store. Find the probability that the selected item is defective.

b) A certain breed of rat shows the mean weight gain of 75gms during the first five months of life. 16 of these rats were fed a new diet from the birth until age of five months. These 16 rats had a mean $\bar{X} = 70.75$ and s = 3.85 is there any reason to believe at 5% level, that the new diet causes a change in the average amount of weight gain. [$P(|t_{15}|>2.131) = 0.05$]. **(7+8)**

2. a) A simple random sample of 15 nursing students who participated in an experiment took a test to measure manual dexterity. The variance of the sample observations was 1225. At 5% level of significance, test the hypothesis that the population variance is different from 2500 given that $P(\chi^2_{14} < 5.368) = P(\chi^2_{14} > 26.873) = 0.05$.

b) Suppose one wishes to see whether Asprin and buffered product are equally effective in alleviating symptoms accompanying Influenza. Length of time (in minutes) from taking the drug to patients saying he feels improved is recorded as follows.

Asprin	Buffered product
$\bar{x}_1 = 14.2$	$\bar{x}_2 = 13.4$
$s_1 = 06.7$	$s_2 = 06.9$
$n_2 = 10$	$n_2 = 20$

State and test the appropriate hypothesis at 5% level of significance [$P(|t_{28}|>2.048)$ 0.05]. **(8+7)**

3. a) A random sample of size 8 was taken from a continuous distribution. The sample values are as follows.

-0.465, 0.12, -0.238, -0.869, -1.016, 1.471, 1.056, 0.561.

At 5% of level of significance, test the hypothesis that the population median is -1 against that it is greater then -1 given that $P(T^+ > 30) = 0.05$. Also carry out the test using normal approximation.

b) To compare the variability of two brands of tyres, the following mileages were obtained for 8 tyres of each type.

Brand A	32.1	20.6	27.8	28.4	29.6	21.4	19.9	30.1
Brand B	29.8	27.6	30.8	27.6	34.1	18.7	16.9	17.9

At 5% level, test the hypothesis that the two samples have come from the same population given that $p(U < 14)$ 0.025. Also carry out the test using the normal approximation. **(7+8)**

4. Four subjects participated in an experiment to compare three methods of relieving stress. Each subject was placed in a stressful situation on three different occasions. Each time a different method for reducing stress was used with the subject. The response variable is the amount of decrease in stress level as measured before and after treatment application. The results were as follows.

Treatment

Subject	A	B	C
1	16	26	22
2	16	20	23
3	17	21	22
4	28	29	36

Set up the concerned hypotheses and test them at 5% level given that $P(F_{2,6} > 5.14) = 0.05$ and $P(F_{3,6} > 4.76) = 0.05$.

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PG3S-432-A-23
M.A/M.Sc. III Semester (CBCS) Degree Examination
STATISTICS
Demography
Paper : SCT 3.1 (a)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

*Answer any **Six** questions from Part - A and any **Five** questions from Part - B.*

PART - A

1. What is census? Distinguish between census and sample survey. **(6×5=30)**
2. Explain Myer's index of measuring age heaping.
3. Define TFR. State its importance and physical meaning.
4. Explain a) Open birth interval
   b) Closed birth interval
5. Explain standardization of death rates and state its limitations.
6. What is life table? Distinguish between complete and abridged life tables.
7. Explain any two methods of construction of life table.
8. Discuss Quasi stable population analysis.

PART - B

9. Explain Chandrasekharan and Dealing method of estimation of missing observation in survey data. **(5×10=50)**
10. Explain Brass P/F ratio method of estimating TFR using incomplete data.
11. Explain different types of mortality.
12. Define force of mortality. With usual notations prove that

    a) $${}_nq_x = \frac{n({}_nm_x)}{1+(n-{}_na_x){}_nm_x}$$

    b) $$\mu_x = -\frac{1}{l_x}\frac{dl_x}{d_x}$$ **(5+5)**

13. State the needs for population projection. Explain the use of Leslie's matrix in population projection.
14. a) Define migration. Explain push pull factors of migration.
    b) Explain the impact of migration on population size and structure. **(5+5)**
15. Derive Lotka's integral equation for stable population.
16. Discuss age structure and birth rate of stable population.

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PG3S-428-A-23

M.A./M.Sc. III Semester(CBCS) Degree Examination

STATISTICS

Stochastic Processes

Paper - HCT 3.1

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer any SIX questions from Part - A

Any FIVE questions from Part-B

PART - A **(6×5=-30)**

1) State and prove Chapman-Kolmogorov equation for obtaining higher stop transition probabilities.

2) Define Periodic state, Absorbing state and Ergadic state.

3) Define Morkov chain and show that the sequence Xn=$\sum_{i=1} n/i.$, where Yi`s are i i d random variables is a Morkov chain.

4) Define Poisson process. State its assumptions.

5) Discuss briefly the compound Poisson process.

6) Define Wiener process by stating the underlying assumptions.

7) For a renewal process, with the usual notations prove that M(t)=$\sum_{n=0}^{\infty} F_n(t)$.

8) If the Galton-Watson branching process {Xn, n$\geq$ 1,Xo=1} is subcritical with off spring mean m, show that $[\Sigma X_n]=\frac{m}{1-m}$.