Sr. No. 754105

January 2023

M.Sc. Environmental Sciences - I SEMESTER

Statistical Methods and Data Analysis (EVS - 105B)

Time: 3 Hours **Max. Marks:75**

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use of simple calculator is allowed.*

PART -A

Q1 (a) Find the mean and variance of the binominal probability distribution. (1.5)

$B(5, ½)$

(b) A problem in statistics is given to three students A, B and C whose chances of solving it are ½ , 1/3, ¼ respectively. What is the probability that the problem will be solved? (1.5)

(c) Differentiate between Negative Correlation and Positive Correlation. (1.5)

(d) Write any three properties of Normal Probability distribution. (1.5)

(e) Two girls were asked to rank 4 different types of beauty products. The ranks given by them are given below: (1.5)

Product	A	B	C	D
Anita	2	1	4	3
Sunita	3	2	1	4

Calculate Spearman's rank correlation coefficient.

(f) What do you understand by the term "Regression" ? Explan. (1.5)

(g) Explain Chi-square test. (1.5)

(h) Explain student's T- test. (1.5)

(i) Differentiate between Q-test and F-test. (1.5)

(j) What are the main assumptions for Lotka-Voltra Model. (1.5)

PART -B

Q2 (a) Find the Mean, Median and Mode using following data: (8)

Marks of students	0-10	10-20	20-30	30-40	40-40
No. of students	5	10	40	20	25

(b) 'A' can hit a target 4 times in 5 shots, 'B' can hit a target 3 times in 4 shots and 'C' can hit twice in 3 shots. They fire a volley. What is the probability that: (7)

1. Exactly two shots hit.
2. At most two shots hit.

Q3 (a) Two random samples were drawn from two normal populations and their values are: (5)

A :- 66, 67, 75, 76, 82, 84, 88, 90, 92

B :- 64, 66, 74, 78, 82, 85, 87, 92, 93, 95, 97

Test whether the two populations have the same variance at 5% level of significance. (Given $F_{0.05} = 3.36$)

(b) The life time (in months) of electric bulbs for random samples of 10 from a large consignment gave the following data: (6)

ITEM	A	B	C	D	E	F	G	H	I	J
LIFE	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average life time of bulb is 4 months? Use T- distribution to test the hypothesis.
(Given $T_{0.02} = 4.4621$)

(c) Use the Q-test to determine whether or not there is an outlier value present in the given data: (Given $Q_{0.09} = 0.9324$) (3)

28, 41, 17, 29, 39, 34, 35, 40, 30, 32

Q4 Explain the following model in detail. (Choose any one) (15)

1. Lotka-Voltra Model
2. Leslie's matrix model
3. Gaussian Plume Model

Q5 (a) From the following data calculate the Karl Pearson's coefficient of correlation. (7)

X	1	2	3	4	5
Y	5	4	3	2	1

(b) Calculate regression equation of " X on Y "and " Y on X " using following data: (8)

X	1	2	3	4	5
Y	1	2	3	4	5

Q6 (a) In an anti-malarial campaign in a certain area, QUININE was administered to 1624 people out of total population of 6496. The number of fever cases is shown below, Use Chi-square test to discuss the usefulness of QUININE in checking malaria. (Given Chi-square at 5% level of significance = 90.546) (9)

Treatment	Fever	No Fever	Total
QUININE	40	1584	1624
No QUININE	440	4432	4872
Total	480	6016	6496

(b) Write a short note on "Quality control charts". (6)

Q7 (a) Using the following data, perform ONE-WAY ANOVA and hence calculate F-ratio. (8)

A	B	C
9	13	14
11	12	13
13	10	17
9	15	7
8	5	9

(b) Four cards are drawn from a well shuffled pack of playing cards. Fine the probability that: (7)

1. All cards are diamonds
2. There is one card of each suit
3. There are two spades and two hearts

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