U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. Semester: IV
Branch: Chemical Engineering Duration: 3 hrs.
Course Code: 19MA4BSSAP Max Marks: 100
Course: Statistics and Probability Date: 22.09.2023

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of Statistical tables is permitted.

UNIT - I

1 a) The following are ages(years) and systolic blood pressure (BP) of 10 healthy adults: **6**

Age(X)	20	43	63	26	53	31	58	46	58	70
BP(Y)	120	128	141	126	134	128	136	132	140	144

Find the linear regression equation X on Y.

b) Fit a parabola $y = ax^2 + bx + c$ to the data. **7**

x	1	2	3	4	5
y	10	12	13	16	19

c) In a distribution which is exactly normal, 12% of the items are under 30 and 85% are under 60. Find the mean & standard deviation of the distribution. **7**

OR

2 a) The following are weights(kg) and blood glucose levels (mg/100ml) of 10 healthy adult males: **6**

Weights(X)	64	75.3	73	82.1	76.2	95.7	59.4	93.4	82.1	78.9
Glucose(Y)	108	109	104	102	105	121	79	107	101	85

Find the Karl Pearson's correlation coefficient of Y on X.

b) The probability that the individual suffers a bad reaction from an injection is 0.001. Find the probability that out of 2000 individuals (i)at most 2 (ii)exactly 2 (iii) more than 2 will get bad reaction. **7**

c) The daily sales (in Rs) of a popular daily in a railway station are a Gamma variant with mean 100 and variance 5000. Find the probability that the sale exceeds Rs 150 in number on a particular day. **7**

UNIT - II

3 a) The joint probability distribution of two random variables X and Y are given as follows: **6**

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.1	0

Find (i) $E(X)$ (ii) $E(Y)$ (iii) $Cov(X,Y)$.

b) Find the unit fixed probability vector of the regular stochastic matrix **7**

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 2/3 & 0 & 1/3 \\ 2/3 & 1/3 & 0 \end{bmatrix}.$$

c) A coin is tossed three times. Let X denote 0 or 1 accordingly as tail or head **7**
occurs on the first toss. Let Y denote the total number of tails which occur.
Determine i) the marginal distributions of X and Y (ii) the joint distributions
of X and Y. Also find the expected values of $X+Y$ and XY.

UNIT – III

4 a) Define the following terms which occurs in the design of experiment: **6**
(i) Treatment (ii) Experimental unit (iii) Experimental error

b) Discuss the randomized block design and its advantages, disadvantages and **7**
layout of design.

c) A 4×4 Latin square experiment was conducted to compare the effects of four **7**
spacings, A, B, C and D, on the yield of millet. Test whether the different
spacings are equally effective for the given data

D-113.4	A-120.3	C-114.7	B-121.4
A-117.3	C-118.3	B-124.4	D-121.7
C-121.4	B-128.7	D-118.7	A-114.3
B-117.8	D-124.3	A-125.6	C-128.7

UNIT - IV

5 a) A sample of size 400 was drawn and the sample mean was found to be 99. Test **6**
whether the sample has come from a normal population with mean 100 and
standard deviation 8 at 5% level of significance.

b) In a sample of 1000 people in Karnataka 540 are rice eaters and rest are wheat **7**
eaters. Can we assume that the both rice and wheat eaters are equally popular in
this state at 1% level of significance?

c) Intelligence test of two groups of boys and girls gives the following results. **7**

	Girls	Boys
Number of students	121	81
Mean (score)	84	81
Standard deviation (score)	10	12

Is the difference between the standard deviations significant?

UNIT - V

6 a) In one sample of 8 observations the sum of the squares of deviations of the **6**
sample values from the sample mean was 84.4 and in the other sample of 10
observations it was 102.6. Test whether the difference in variability is
significant at 5% level of significance.

b) Memory capacity of students was tested before and after giving the healthy foods. Test whether the healthy food was effective or not from the following scores of students **7**

Roll No.	1	2	3	4	5	6	7	8	9	10
Before	12	14	11	8	7	10	3	0	5	6
After	15	16	10	7	5	12	10	2	3	8

c) In a cross between rust-resistant and rust-susceptible varieties of oats, the F_3 families were compared for rust reaction in the seedling stage and in the field under ordinary epidemic conditions. The data are as follows: **7**

Field Reaction	Seedling Reaction		
	Resisting	Segregating	Susceptible
Resisting	142	51	7
Segregating	13	404	5
Susceptible	5	17	176

Test whether the rust reaction is independent in two stages.

OR

7 a) In a Mendelian experiment on breeding, four types of plants are expected to occur in the proportion 9:3:3:1. The observed frequencies are 891 round and yellow, 316 wrinkled and yellow, 290 round and green, and 119 wrinkled and green. Find the Chi-square value and examine the correspondence between the theory and the experiment. **6**

b) A group of 10 rats fed on a diet A and another group of 8 rats fed on a different diet B, recorded the following increase in weights. **7**

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	10	1	2	8	-	-

Does it show the superiority of diet A over that of B.

c) Analyse the following data test whether all the class effects are equal or not using one-way ANOVA test. **7**

Class

A	B	C	D
1.60	1.40	1.50	2.1
1.81	1.80	1.60	2.3
1.63	1.64	1.80	2.4
1.65	1.91	-	2.5
1.70	1.81	-	-
1.71	2.01	-	-
1.81	-	-	-

******