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[This question paper contains 8 printed pages.]

- (iii) What conclusion would be drawn from the findings? (12)

Your Roll No.....

Sr. No. of Question Paper : 7391

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Unique Paper Code : 2533012002

Name of the Paper : Applications of Statistics in Biology (DSE)

Name of the Course : **B.Sc. (H) Microbiology**

Semester : UGCF (NEP), Part-IV, Semester-VIII

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions.
3. **All** questions carry equal marks.
4. Use of non-scientific calculator/log tables is allowed.

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1. (a) Fill in the blanks (**any six**) : (1×6=6)

- (i) Arrangement of data into groups or categories is called _____ .
- (ii) The most frequently occurring value is called _____ .
- (iii) The relationship between two variables without causation is measured by _____ .
- (iv) In binomial distribution, the number of trials is denoted by _____ .
- (v) Normal distribution is also called _____ curve.
- (vi) T-test is when the value of n is less than _____ .
- (vii) Level of significance is denoted by _____ .

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sufferers and the time to pain relief after taking the new headache pill was recorded and given as follows :

Patient ID	1	2	3	4	5	6	7	8	9	10
Relieve Time	6.8	6.6	6.2	5.2	4.9	6.1	6.6	5.5	6.3	5.8

Under the assumption that the time to relieve a headache is normally distributed, does the sample provide evidence to support the pharmaceutical company's belief that the new headache pill gives relief in less than 6 minutes at the 1% level of significance? (Given: $-t_{(n-1),\alpha} = -2.821$)

- (i) Formulate the null and alternative hypotheses for this situation.
- (ii) Whether the Z-test or t-test is appropriate for testing the belief and why?

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(i) Skewness and Kurtosis

(ii) Hypothesis Testing

(iii) Standard distributions

(b) The following is the applications of disinfectant (in % solution) (X) and zone of inhibition in (mm)(Y). Obtain a regression equation.

X	2	4	6	8	10
Y	5	8	11	12	15

(i) Find the regression equation of Y on X

(ii) Find Y for X = 4, 16, 28 (6)

6. A pharmaceutical company has produced a new headache pill and it is claimed that the average time to relieve a headache is less than 6 minutes. A study was conducted on 10 randomly selected headache

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(b) Find the Karl Pearson's coefficient of correlation coefficient between X and Y from the following data (Storage time vs probiotic viability)

X (Days)	2	4	6	8	10
Y ((% Viability)	90	85	88	80	82

(6)

2. (a) Define the following (**any six**) – (1×6=6)

(i) Central limit theorem

(ii) Statistics

(iii) Sampling

(iv) Estimator

(v) P-value

(vi) Tabulation of data

(vii) Continuous variable

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- (b) The plaque count obtained from different plates are 12, 5, 10, 4, 8, and 10. Find the variance and standard deviation. (6)

3. (a) State true or false (**any six**): (1×6=6)

- (i) Random variable always takes integer values. (T/F)
- (ii) Poisson distribution is continuous. (T/F)
- (iii) Mean is not affected by extreme values. (T/F)
- (iv) p-value measures strength of evidence. (T/F)
- (v) Null hypothesis is denoted by H_A . (T/F)
- (vi) F-test compares variances. (T/F)
- (vii) Sampling distribution refers to distribution of sample statistics. (T/F)

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- (b) If, $n = 10$, $\bar{x} = 5$, $\sum x^2 = 290$, find the coefficient of variation. (6)

4. (a) Differentiate between the following (**any two**) – (3×2=6)

- (i) Parametric and non-parametric tests.
- (ii) Regression and Correlation.
- (iii) Type I Error and Type II Error.

- (b) Let X be the number of tails when a coin is tossed twice. Find the probability distribution. (2)

- (c) Calculate the mean, mode and median from the data 8, 6, 3, 2, 12, 13, 6, 10, 15, 2, 9, 4, 19, 11, 4 (4)

5. (a) Write short notes on the following (**any two**): (3×2=6)

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