

RAN-2503001304033001 / 2503000504031111
B. Sc. Biotechnology (NEP) (Sem.IV) Examination April - 2026
BT-MJ-403 Application of Statistical Methods in Biology II
Time: 2 Hours]
[Total Marks: 50
સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book
- (2) Figures to the right indicate full marks.
- (3) Draw neat and labelled diagrams wherever necessary.
- (4) Graph paper and Log book should be provided on request of the students.
- (5) Use of non-programmable scientific calculator is allowed.

Seat No.:

Student's Signature

Q. 1. Answer the following:
08

- (a) If X follows a Poisson distribution such that $P(X=2) = 9P(X=4) + 90P(X=6)$. Find mean and variance of this distribution
- (b) The coefficient of correlation between two variables X and Y is 0.42 and their covariance is 10.5. If variance of series X is 4, then find the standard deviation of series Y.
- (c) For bivariate data the value of b_{YX} is 4 and b_{XY} is $1/9$. Calculate coefficient of correlation.
- (d) Calculate the Simple aggregate price index for year 2010, if for the year 2010 $\sum p_1 = 850$ and for year 2009 $\sum p_0 = 500$.

Q. 2. Do as directed
06

- (a) Attempt **Any One** out of Two:
 - (i) Write a note on normal and binomial probability distribution, emphasising on its properties
 - (ii) The probability of occurrence of an occupational disease to a worker of a chemical factory is $1/4$. If 5 workers are chosen for another chores, find the probability that
 - a) no worker among the chosen are having the diseases
 - b) 2 out of 5 chosen at random will suffer from the disease
 - c) less than 3 out of 5 chosen at random will suffer from the disease
- (b) Attempt **Any Two** out of Three:
 - (i) Enlist the properties of correlation coefficient. Describe Scatter plot method for correlation when $r = +1$, $r = 0$ and $r = -1$.
 - (ii) The data of change in amount of plant extract (mL) and growth of biomass (mg/L) was note down for six flasks as follows

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Flask	A	B	C	D	E	F
plant extract (mL)	3	4	9	2	7	5
growth of biomass (mg/L)	13	10	8	11	14	16

Calculate coefficient of correlation using Actual mean method between plant extract volume and amount of biomass. Give your comments.

- (iii) The overall product feedback was taken for two products, P1 and P2. They were given rating out of 50 Points. The rating was taken from five customers. Find the rank correlation and give your comments

Costumers	1	2	3	4	5
P1	50	40	30	20	10
P2	50	40	10	30	20

Q. 3. Do as Directed

- (a) Attempt **Any One** out of Two **05**
 (i) Describe Correlation Analysis. Explain any one method for measure of corelation coefficient.
 (ii) Calculate the Rank correlation for the following data

X	74	98	110	70	65	85	88	59
Y	121	133	170	102	90	152	160	85

- (b) Attempt **Any One** out of Two **06**
 (i) Describe Regression line X on Y and Y on X and its application
 (ii) Form the production data of a fertilizer company, with respect to the change in pH of the reactor is given below. Fit a straight-line trend by method of least squares.

Reactor	1	2	3	4	5
pH	6	2	10	4	8
Production	9	11	5	8	7

Q. 4. Do as Directed

- (a) Attempt **Any One** out of Two **05**
 (i) Given $4X - 5Y + 33 = 0$, $20X - 9Y = 107$, Find the correlation coefficient r
 (ii) Derive two regression lines/ equations for the given data-
 $\bar{X} = 30$, $\bar{Y} = 23.3$, $\sum X^2 = 2120$, $\sum Y^2 = 953.3$, $\sum XY = 1300$, $N = 10$.
 (b) Attempt **Any Two** out of Three **12**
 (i) Write a note on Index number. Describe the methods to calculate index number.
 (ii) From the following data construct Price Index and Quantity Index by Laspeyre's and Paasche's method

Commodity	Base Year		Current Year	
	Price per unit (Rs.)	Total Expenditure (Rs.)	Price	Quantity
A	3	90	10	50
B	12	360	30	10
C	10	100	25	14
D	8	320	20	20

- (iii) Verify that the Factor Reversal test and Time reversal test are satisfied by Fisher's formula for given information.

Commodity	Base Year		Current Year	
	Price per unit	Quantity	Price per unit	Quantity
Apple	20	8	40	6
Biscuit	50	10	60	5
Coffee	40	15	50	15
Detergent	20	20	20	25
