UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 6th Semester Examination, 2023

DSE-P4-Microbiology

Time Allotted: 2 Hours   Full Marks: 40

The figures in the margin indicate full marks.

**The question paper contains two sections DSE-7 and DSE-8.
The candidates are required to answer any *one* from *two* sections and
Candidates should mention it clearly on the Answer Book.**

DSE-7 (Microbes in Sustainable Agriculture and Development)

1. Answer any *five* of the following: 1×5 = 5
   (a) What are MHBs?
   (b) Name a microbe that plays a role in the degradation of cellulose.
   (c) What is meant by silage?
   (d) What is nitrification?
   (e) What are transgenics?
   (f) Give an example of a Bt crop.
   (g) What is mycorrhiza?
   (h) What is biomanure?

2. Answer any *three* of the following: 5×3 = 15
   (a) Explain the process by which *Rhizobium* forms nodules in plants.   5
   (b) Describe in detail about the production of greenhouse gas nitrous oxide from soil.   5
   (c) How do microbes play a role in degradation of lignin?   5
   (d) Explain the role of microbes in phosphate solubilization.   5
   (e) How are biofertilizers advantageous over chemical fertilizers? State one   4+1
       limitations of using biofertilizers.

3. Answer any *two* of the following: 10×2 = 20
   (a) Describe the process of biogas production with proper schematic diagram. Add a   6+4
       note on advantages and disadvantages of biogas.
   (b) What are biofuels? Describe the production and advantages of any one of the   2+6+2
       biofuel. Write a note on greenhouse gases.
   (c) How do microbes help in controlling carbondioxide and methane from the   5+5
       environment?
   (d) Write short note on: 5+5
       (i) Bt Crops
       (ii) *Frankia* biofertilizer.

DSE-8 (Biomathematics and Biostatistics)

1. Answer any *five* of the following: 1×5 = 5

   (a) Define the term "attributes".

   (b) Define regression.

   (c) What is statistical error?

   (d) Define matrix.

   (e) What is 'measures of dispersion'?

   (f) Define correlation.

2. Answer any *three* of the following: 5×3 = 15

   (a) Evaluate the following limits:
   $$\lim_{x \to 2} \frac{x^3 + 2}{x + 1}$$

   (b) Describe some major properties of Normal distribution.   5

   (c) Construct $a < x$ matrix whose elements are given by $a_{ij} = \frac{1}{2}(2i - 3j)$.   5

   (d) Write down characteristics of central tendency.   5

   (e) Find the arithmetic mean of the following:

Length (μm)	1-3	4-6	7-9	9-11
No. of cells	12	33	57	63

3. Answer any *two* of the following: 10×2 = 20

   (a) Show that   10
   $$\log 2 + 16 \log \frac{16}{15} + 12 \log \frac{25}{24} + 7 \log \frac{51}{80} = 1 \text{ (when base is 10)}$$

   (b) Cell length of hypothetical bacteria was obtained from two culture broth. They were measured as follows (in μm) :

Broth A	20	24	20	28	26	20	24	32	24	26
Broth B	12	10	9	10	6	4	14	20	10	6

   Calculate the mean difference in total cell length between two broth of bacteria is significant or not.

   (c) From, the results of two variable x and y:
   $$\bar{x} = 36, \ \bar{y} = 55, \ \sigma_x = 10, \ \sigma_y = 8, \ r(x, y) = 0.66$$
   Find the two regression equations and estimate the value of x, when $y = 75$.

   (d) Length and breadth of fungal conidia are given below (μm):

Length (x)	32	38	48	43	40	22	41	69	35	64
Breadth (y)	30	31	38	43	33	11	27	76	45	55

   Calculate Pearson's coefficient of correlation between x and y.

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