'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 6th Semester Examination, 2023

DSE-P4-BOTANY

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.

The paper contains Paper-1, Paper-2, Paper-3, Paper-4, Paper-5, Paper-6, Paper-7, Paper-8 and Paper-9. The candidates are required to answer any *one* from the *nine* papers except the one attempted at DSE3. The candidates should mention it clearly on the Answer Book.

PAPER-1

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

GROUP-A

1. Answer any ***five*** questions from the following: 1×5 = 5
   (a) What is homogenization?
   (b) What is the role of marker enzyme in cell fractionation?
   (c) Name a dye used for DNA in Gel electrophoresis.
   (d) What do you mean by resolution of a microscope?
   (e) Write down the full form of FISH.
   (f) Name a suitable chromatographic technique to separate chloroplast pigments.
   (g) Name two radioisotopes widely used in biological research.
   (h) What do you mean by positive staining?

GROUP-B

2. Answer any ***three*** questions from the following: 5×3 = 15
   (a) What is Pulse-Chase experiment? Explain its role in Biology. 2+3
   (b) Differentiate between $2\frac{1}{2}+2\frac{1}{2}$
      (i) Colorimetry and Spectrophotometry
      (ii) Magnification and Resolution.
   (c) Explain how protein can be characterized using PAGE. 5
   (d) What do you mean by sampling and samples? How does sample differ from the population? 2+3
   (e) Discuss about Principle of centrifugation technique and its application. 2+3

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20
   (a) Write an essay on mass-spectrometry mentioning its principle, applications, scope and limitations. 3+3+2+2

(b) Describe different methods of data representation along with their advantages and disadvantages. 6+2+2

(c) Write short notes on: 5+5
(i) X-ray crystallography
(ii) Scanning electron microscope.

(d) Describe the following technique and their applications: 5+5
(i) Shadow Casting
(ii) Autoradiograph.

PAPER-2

BIOINFORMATICS

GROUP-A

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

(a) What is computational biology?

(b) What is FASTA?

(c) Differentiate between analogy and homology.

(d) What is TAIR-BLAST?

(e) Name a scoring matrix that is used to score alignments between closely related sequences of amino acids.

(f) What is INSDC?

(g) Name one web tool and software used in bioinformatics.

(h) What is DDBJ?

GROUP-B

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

(a) Define phylogeny. Draw a comparison between NJ and ML method of phylogeny. 1+4

(b) Write a short note on the architecture of BLAST. 5

(c) What is BLINK? Distinguish between local pairwise alignment and global pairwise alignment. 1+4

(d) Briefly discuss the importance of QSAR technique in Drug discovery. 5

(e) Elucidate nucleic acid and protein sequence databases and their respective tools for exploration. 3+2

GROUP-C

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

(a) Define scoring matrix. Examine the application of BLAST and CLUSTALW. What are rooted and unrooted trees? 2+6+2

(b) How would you submit a nucleotide sequences in DDBJ Database? Write a short note on PIR. 5+5

(c) What is the role of Bioinformatics in microbial genome and crop improvement? 5+5

(d) Distinguish between PAM and BLOSUM. State the data submission system of NCBI. What is the use of CLUSTAL omega? 4+4+2

PAPER-3

STRESS BIOLOGY

GROUP-A

1. Answer any ***five*** questions from the following: 1×5 = 5
   (a) What is superoxide?
   (b) What is the function of SOD?
   (c) What is NINJA?
   (d) What is PR protein?
   (e) Define ROS.
   (f) Name a plant where sunken stomata is found.
   (g) What is systematic acquired resistant?
   (h) Name one salinity tolerant plant.

GROUP-B

2. Answer any ***three*** questions from the following: 5×3 = 15
   (a) Mention the role of PR protein in plant defence mechanism. 5
   (b) Mention the differences between acclimation and adaptation. 5
   (c) What is systemin? How does it help in signal transduction? 1+4
   (d) What are glycophytes? How do they differ from halophytes? 1+4
   (e) What are various types of pathogenesis related proteins? Describe in detail. 5

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20
   (a) Describe one model of JA signalling. Add a note on termination of JA triggered defense response. 10
   (b) Write short notes on: 5+5
      (i) Physical defence mechanisms
      (ii) Aerenchyma development.
   (c) How do plants generate hypersensitivity reactions? 10
   (d) Describe the various developmental mechanisms that protect plants against environmental stress. 10

PAPER-4

PLANT BREEDING

GROUP-A

1. Answer any ***five*** questions from the following: 1×5 = 5
   (a) What is allopolyploidy?
   (b) Write the full form of NBPGR.
   (c) What is mutation breeding?

(d) Define restorer line in male sterility.
(e) Name two chemical mutagens.
(f) What do you mean by emasculation?
(g) Define heterosis.
(h) Name two chemicals used in male sterility method.

GROUP-B

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

(a) Define hybrid vigor. Explain the dominance hypothesis of heterosis. 1+4
(b) Illustrate the acclimatization methods for crop improvement. 5
(c) What do you mean by pureline selection? Write the advantages of pureline selection. 2+3
(d) Describe with suitable examples the role of polyploids in plant improvement. 5
(e) What do you mean by hybridization? Mention the basic steps of hybridization process. 2+3

GROUP-C

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

(a) What is induced mutation? How will you perform breeding in negatively propagated plants? What is inbreeding depression? 2+5+3
(b) Write short notes on: 5+5
(i) Role of Biotechnology in crop improvement
(ii) Cytoplasmic male sterility.
(c) Elucidate the procedure, advantage and limitations of cross pollinated crops. 10
(d) Distinguish between 5+5
(i) Mass selection and Pureline selection
(ii) Monogenic inheritance and Polygenic inheritance.

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

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

(a) Define afforestation.
(b) What is composting?
(c) What is eutrophication?
(d) Name any two Biodiversity Hotspot in India.
(e) What is Biopiracy?
(f) What is bioprospecting?
(g) What is β-diversity?
(h) Define aquifer.

GROUP-B

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

(a) Discuss the various soil restoration procedure. 5

(b) Discuss the importance of National Biodiversity Action Plan. 5

(c) Write short notes on: $2\frac{1}{2} + 2\frac{1}{2}$

(i) Wetland Conservation strategies

(ii) Resource Accounting.

(d) What is Silviculture? What are its importance? 2+3

(e) Classify and characterize estuary. 2+3

GROUP-C

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

(a) What is biodiversity? What are the various levels of biodiversity? Discuss the reasons for biodiversity loss. 2+3+5

(b) Give an account of various sources of waste and its effects on the environment. 10

(c) Write short notes on: 5+5

(i) Hotspot of Biodiversity

(ii) Forest Act.

(d) Discuss in brief about Genetic, Species and Ecosystem Diversity. 3+3+4

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

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

(a) What is air layering?

(b) Write the name and pathogen of the common disease seen in nursery.

(c) What is lawn?

(d) What do you mean by the term “Loose flower”?

(e) What is urban forestry?

(f) Give the full form of PGR.

(g) Define germplasm.

(h) What is totipotency?

GROUP-B

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

(a) Briefly describe the terms: $2\frac{1}{2} + 2\frac{1}{2}$

(i) Bonsai, (ii) Cut flowers.

(b) Mention the role of micropropagation and tissue culture technique in horticulture. $2\frac{1}{2} + 2\frac{1}{2}$

(c) What is the most important PGR which responsible for fruit ripening? How it helps in fruit ripening? 1+4

(d) What is IPM? Mention the four different types of management practices employed in IPM. 1+4

(e) Briefly discuss the role of micropropagation in germplasm conservation.

GROUP-C

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

(a) Give an account of the biopesticides with suitable examples. 10

(b) Discuss the salient features of Mughal style of landscaping and garden design. 10

(c) Write short notes on: 5+5

(i) Crop sanitation

(ii) Importance in food and nutritional security.

(d) What is food safety? Mention the advantages and disadvantages of food irradiation. 2+8

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

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

(a) Name one acidic and one basic dye used in Botany laboratory.

(b) What is the role of fixative?

(c) Define central tendency.

(d) How is ultrathin section prepared?

(e) Define genomics.

(f) Name one toxic chemical used in laboratory.

(g) What is copyright academics misconduct?

(h) Write down the full form of GFP.

GROUP-B

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

(a) Define Molarity. How is 5M NaOH solution prepared? 1+4

(b) Discuss the techniques of handling micropipette and the factors affecting the accuracy of micropipette. 2+3

(c) Write short note on use of model organism in Biology. 5

(d) Distinguish between coagulating fixatives and non-coagulating fixatives. 5

(e) What is the scale bar? Write its application in microscopic image. 2+3

GROUP-C

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

(a) Write down the importance of labelling on reagent bottle. What are the symbols labels used in chemical safety? Calculate the molarity of 20% of NaOH solution. 4+3+3

(b) Write short notes on: 5+5
(i) Importance of literature review in research
(ii) Imaging of tissue specimen.

(c) Distinguish between 5+5
(i) Library research and field research
(ii) Genomics vs. Proteomics.

(d) Classify different types of stains used in Biology based on their chemistry. Describe the procedure of differential staining of section of stem of an angiosperm. 4+6

PAPER-8

INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

GROUP-A

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

(a) What is semisynthetic penicillin?
(b) Name one water-borne human pathogenic bacteria.
(c) What is immobilized enzyme?
(d) What is leghemoglobin?
(e) Give the full form of VAM.
(f) Define COD.
(g) Name one free living nitrogen fixing microorganism.
(h) What is lyophilization?

GROUP-B

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

(a) Briefly discuss the large-scale application of immobilized enzymes. 5
(b) Describe the process of industrial production of citric acid. 5
(c) State the differences between stationary and submerged fermentation techniques. 5
(d) Write short notes on: $2\frac{1}{2} + 2\frac{1}{2}$
(i) TOC
(ii) Solid state fermentation.
(e) Briefly mention the role of microorganism as a water quality indicators. 5

GROUP-C

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

(a) How is penicillin made by fermentation? Discuss the mechanism for industrial production of penicillin. 4+6
(b) What is bulking sludge? Name several important microbial groups that contribute to this problem. Discuss, in detail, the aerobic secondary sewage treatment procedure with proper diagram. 1+1+8
(c) Describe the isolation processes of microorganisms from soil and water. 10
(d) Write short notes on: 5+5
(i) Bioremediation
(ii) Bioreactor.

PAPER-9

BIOSTATISTICS

GROUP-A

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

(a) What is meant by Random sampling?

(b) What is standard error?

(c) What is meant by ordinal data?

(d) What is alternate hypothesis?

(e) What is the significance of histogram?

(f) Define correlation.

(g) What do you understand by degree of freedom?

(h) Find the geometric mean of 12 and 27.

GROUP-B

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

(a) What is arithmetic mean? What are the different types of Arithmetic Mean? Find the arithmetic mean from the following data where the rate of respiration of 43 fishes and their respective frequency is given. 5

Rate of Respiration	2	16	20	30	39	40	45	49	50	65	70	79	80
Frequency	3	4	7	7	1	3	5	1	2	2	5	1	2

(b) Length of 15 Earthworms were recorded as 30, 32, 31, 38, 35, 37, 35. 42, 41, 36, 38, 42, 39, 40 and 44 cm. Calculate the mode of observe observation. 5

(c) What are ogives? Explain the methods employed for the collection of primary data. 2+3

(d) Write a note on computer application in Biostatistics. 5

(e) How is a table formed? Give its components. 5

GROUP-C

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

(a) Find the geometric mean for the data given below: 8+2

Marks	4-8	8-12	12-16	16-20	20-24	24-28
Frequency	6	10	18	30	15	12

Differentiate between Arithmetic mean and Geometric mean.

(b) What do you mean by χ^2-test of goodness of fit? In F_2 generation, Mendel obtained 620 tall plants and 188 dwarf plants out of total 808 plants. Test whether the result is in accordance with Mendelian monohybrid ratio or that they from it. 3+7

(At 1 df, $\chi^2_{\alpha=0.05} = 3.84$)

(c) What is sampling? Describe the different methods of sampling. What are the criteria for good sampling? 1+7+2

(d) Write short notes on: 5+5

(i) Histogram

(ii) Similarities and dissimilarities of correlation and regression.

——×——