



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2024

DSE-P2-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 DSE1. 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
- What is measure of dispersion?
 - Expand FISH.
 - Name two radioisotopes that can be used for DNA research.
 - What is goodness of fit?
 - What is the role of negative staining in electron microscopy?
 - What is the full form of MALDI-TOF?
 - What is transmission?
 - What is the function of ultracentrifugation?

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- Briefly discuss the different methods of data presentation. 5
 - Write short notes on: 5
 - Freeze etching, (ii) Chromosome painting.
 - Briefly discuss the principle of affinity chromatography. 5
 - Differentiate between HPLC and TLC. 5
 - State the working principle of spectrophotometer. Mention its applications. 4+1

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- Write short notes on: 5+5
 - Sample preparation for electron microscopy, (ii) GLC.

- (b) Differentiate between: 5+5
 (i) TEM and SEM, (ii) AGE and PAGE.
 (c) What is autoradiography? Discuss in detail Pulse-Chase experiment. What are marker enzymes? Give examples. 1+6+3
 (d) Write notes on:
 (i) FACS, (ii) Western blotting.

PAPER-2

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
 (a) What is B-Link?
 (b) What is the full form of PAM?
 (c) Define BLOSUM.
 (d) What is RDBMS?
 (e) Name the tools used for pairwise and multiple sequence alignment.
 (f) Draw a rooted phylogenetic tree.
 (g) Give one example each of a nucleotide sequence database and a protein sequence database.
 (h) Give an example of GenBank file format.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
 (a) What is the importance of Biological database? Define secondary database with example. 3+2
 (b) How does QSAR techniques help to predict activity for new compounds? 5
 (c) Write short note on different types of Standard Scoring Matrices. 5
 (d) What is EMBL? Give a schematic representation of sequence submission on EMBL database. 1+4
 (e) Differentiate between: 2½+2½
 (i) PHI-BLAST and PSI-BLAST
 (ii) Bootstrapping and Jack-knifing.

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
 (a) Write short notes on: 5+5
 (i) Swiss-Prot (ii) DDBJ
 (b) Discuss the role of computational biology in crop improvement and drug designing. 5+5
 (c) What do you mean by consistency of molecular phylogenetic prediction? Briefly explain. Write a short note on architecture of BLAST. 5+5
 (d) Elucidate nucleic acid and protein structure databases and their respective tools for exploration. What is TAIR-BLAST? 4+4+2

PAPER-3

STRESS BIOLOGY

GROUP-A

1. Answer any
- five**
- questions from the following:

1×5 = 5

- What are heat shock proteins?
- Which plant hormones accumulates in the water stressed leaves?
- Define ephemerals or short lived plants.
- Name one halotolerant plant.
- Write down the full form of DAG and ROS.
- What are osmoprotectants?
- Define permanent wilting point.
- Give two examples of compatible solutes.

GROUP-B

2. Answer any
- three**
- questions from the following:

5×3 = 15

- Define acclimation. Explain the reason for closure of stomata under water stress condition. 1+4
- Write a short note on metabolic dysfunction in plants during stress conditions. 5
- Discuss the mechanism of abiotic stress management in plants by Absciscic acid. 5
- Write short notes on:
 - Phenotypic plasticity
 - Role of heat shock protein in plant stress.
- Explain the terms Highlight stress and Temperature stress. $2\frac{1}{2} + 2\frac{1}{2}$

GROUP-C

3. Answer any
- two**
- questions from the following:

10×2 = 20

- Discuss the phospholipid signalling mechanism involved in stress response of plants. 10
- Write short notes on:
 - ROS scavenging activity,
 - Osmotic adjustment.
- Justify how aerenchyma development is an adaptation in plants against environmental stress management. 10
- Define acclimation. Illustrate the physical and physiological defence mechanism of plants during stressed environmental conditions. 2+8

PAPER-4

PLANT BREEDING

GROUP-A

1. Answer any
- five**
- questions from the following:

1×5 = 5

- Write the full form of NBPGR.
- What is pure line?
- Define restorer line in male sterility.

- (d) What do you mean by inbreeding depression?
- (e) Define clone.
- (f) What do you understand by the term incompatibility?
- (g) Mention the two types of DNA markers used in molecular breeding.
- (h) Name one cross-pollinated crop.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) Define molecular markers. Mention the uses of DNA markers in plant breeding. 1+4
 - (b) State the contrivances and consequences of self-pollination in crops. 5
 - (c) Briefly describe apomixis mode of reproduction. 5
 - (d) Define male sterility. What are its different types? Explain the controlling factors of male sterility briefly. 1+2+2
 - (e) Discuss the primary objectives of plant breeding. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) Illustrate the process of domestication of crop plants. Write down the significance of PGPR with examples. 5+5
 - (b) Write short notes on: 3+3+4
 - (i) Adventitious
 - (ii) Undesirable consequences of plant breeding
 - (iii) Role of mutation in crop improvement.
 - (c) Discuss the different methods of crop improvements. State the limitation and opportunities of these methods. 5+5
 - (d) Define quantitative inheritance. Explain the mechanism of inheritance of Kernel color in wheat and skin color in human beings.

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- (a) What is the full form of EIA?
 - (b) What is bioprospecting?
 - (c) Mention two renewable sources of energy.
 - (d) Define afforestation.
 - (e) Write the full form of IPR.
 - (f) Define the term silviculture.
 - (g) Name one timber yielding tree.
 - (h) Mention one role of CBD.

GROUP-B

2. Answer any **three** questions from the following: $5 \times 3 = 15$
- Write an account on silviculture and its importance. 5
 - Briefly discuss different categories of IUCN Red Data Book with examples. 5
 - What is Resource Accounting? Explain. 5
 - Mention the major causes of soil erosion. Briefly describe the process of soil restoration. $2+3$
 - Write notes on: $2 \frac{1}{2} + 2 \frac{1}{2}$
 - Biodiversity hotspots
 - GIS

GROUP-C

3. Answer any **two** questions from the following: $10 \times 2 = 20$
- Define forest. What is forest cover? Mention the significance of forest cover with reference to India in brief. What are major and minor forest products? $1+1+3+2 \frac{1}{2} + 2 \frac{1}{2}$
 - Discuss the role of freshwater in conservation of environment. How can estuarine be conserved? $6+4$
 - Illustrate the economic, ecological and socio-cultural approaches in context to sustainable utilization of natural resources. 10
 - Write notes on the following: $3+4+3$
 - National Biodiversity Action Plan
 - Solid Waste Management
 - Non-renewable sources of energy.

PAPER-6**HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY****GROUP-A**

1. Answer any **five** questions from the following: $1 \times 5 = 5$
- What is ecotourism?
 - Define biofertilizer.
 - Name the scientific names of two cut flowers of high demand in Indian market.
 - Mention two salient features of Mughal garden.
 - Name two types of PGR.
 - What is totipotency?
 - What is IPM?
 - Name one nationally important horticultural center for the sources of information.

GROUP-B

2. Answer any **three** questions from the following: $5 \times 3 = 15$
- Give a brief account of urban forestry. 5
 - Write a short note on hydroponics and its application. 5
 - Describe the role of horticulture in rural economy and employment generation. 5
 - Mention the techniques used in IPM strategies. 5
 - Comment on plant growth regulators. 5

GROUP-C

3. Answer any **two** questions from the following: $10 \times 2 = 20$
- (a) Discuss in brief the different types of propagation methods usually observed in horticultural practices. 10
- (b) Write the salient features of the following: $3+3+3+1$
- (i) Orchids (ii) Rose (iii) Gerbera
- Mention two examples of ornamental flowering trees.
- (c) Write down the name of any one variety of the following plants with their identifying features: $(1+2) \times 3 + 1$
- (i) Citrus (ii) Mango (iii) Banana
- What is crop sanitation?
- (d) Write down the names of two pests of Rose and Marigold. Name two fungal diseases of Citrus and Banana. Name one bacterial disease of Cucurbits and cite the name of that bacteria. $(2+2) + (2+2) + 2$

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

1. Answer any **five** questions from the following: $1 \times 5 = 5$
- (a) Why do we need to write references in research findings?
- (b) Name any tag except GFP.
- (c) What is the use of exposure time in photography?
- (d) What is pie-chart?
- (e) Explain 'empirical' research.
- (f) Define 1 mM solution.
- (g) What is the difference between a regular pipette and micropipette?
- (h) What is a molar solution?

GROUP-B

2. Answer any **three** questions from the following: $5 \times 3 = 15$
- (a) What is laboratory research? Give its importance. $1+4$
- (b) What is 1N solution? Write the process and calculation in preparing 2N H_2SO_4 (commercially available H_2SO_4 is 36N). $1+4$
- (c) Write short notes on: $2 \frac{1}{2} \times 2 = 5$
- (i) Scale bars and their applications
- (ii) Physical vs Chemical fixation.
- (d) Write a short note on plagiarism. 5
- (e) What are the various staining equipments known to you? 5

GROUP-C

3. Answer any **two** questions from the following: $10 \times 2 = 20$
- (a) Give an account of maceration and sectioning. $2 \frac{1}{2} \times 2 = 5$
- Write recent trends in the field of proteomics and transcriptional regulatory research. $2 \frac{1}{2} \times 2 = 5$

- (b) What do you mean by whole mount? How it differs from peel mount? Explain the process of paraffin and plastic infiltration. When are these used? 2+2+2
+2+2
- (c) Write short notes on: 5+5
- Imaging of tissue specimen
 - Scientific writing and ethics.
- (d) How will you prepare 10% NaCl solution? How will you dilute it to make a 1% solution? What are the common toxic chemicals and safety measures to handle them? 3+3+2+2

PAPER-8

GROUP-A

1. Answer any **five** questions: 1×5 = 5
- What is 'production fermenter'?
 - What is the safe BOD for drinking water?
 - Name one microbe used in cheese industry.
 - Explain the term 'ultrafiltration'.
 - Name one fungus that is frequently isolated from air.
 - Explain 'faecal coliform'.
 - Name one free-living nitrogen fixer.
 - Explain 'bioventing'.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Describe the process of isolating micro-organisms from air. Which medium is used for this process? 4+1
 - How will you screen the micro-organisms for starch hydrolysis? Describe in brief. 5
 - Describe in brief the different stages of downstream processing. 5
 - Write short notes on: $2\frac{1}{2} \times 2 = 5$
 - Penicillin acylase production
 - Cell disruption methods.
 - Differentiate between ectomycorrhizae and endomycorrhizae. Give their uses. 5

GROUP-C

3. Answer any **two** questions: 10×2 = 20
- Define water pollution. What are the biological pollutants contributing to this? Explain with special reference to the various indicators of water pollution. 2+8
 - Explain the various modes of bioremediation of contaminated soils. Give diagrams. What are its disadvantages? 6+4
 - Write short notes on: 5+5
 - Stationary process of fermentation
 - Ion exchange chromatography.
 - Describe in detail the process of industrial production of alcohol. Give the diagrams and the micro-organisms involved. 8+2

PAPER-9

GROUP-A

1. Answer any
- five**
- questions:

1×5 = 5

- What is statistic?
- Explain the term 'random sampling'.
- Find the geometric mean of 13 and 26.
- Explain dispersion.
- What is cumulative frequency?
- What is alternative hypothesis?
- What is S.E.?
- If the two variables do not show any correlation in correlation analysis, is it possible to do regression analysis? Give one reason.

GROUP-B

2. Answer any
- three**
- questions from the following:

5×3 = 15

- Differentiate between G.M. and A.M. 5
- Calculate the A.M. for the height of rice plant (in cm.) from the following data: 5

Height (in cm.)	10-20	20-30	30-40	40-50	50-60	60-70
No. of plants	5	10	30	40	15	10

- What are the similarities and dissimilarities in correlation and regression? 5
- What is 'root mean square deviation'? Calculate this value for the following data: 2+3

11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21.

- Give formula for χ^2 calculation. What is degree of freedom? 2+1+1+1

GROUP-C

3. Answer any
- two**
- questions:

10×2 = 20

- What is range? How does it differ from mean deviation? Differentiate between quartile deviation and standard deviation. Give formula for each measure. 1+2+3+4
- Calculate mean, median, standard deviation and variance for the following data: 2½×4=10

Height (in inches.)	95-105	105-115	115-125	125-135	135-145
No. of plants	19	23	36	70	52

- Obtain the equation of the line of regression of yield of rice (Y) and water (X). 10

Water (in inches)	12	18	24	30	36	42	48
Yield (in tons)	5.27	5.68	6.25	7.21	8.02	8.71	8.42

Estimate the most probable yield of rice for 50 inches of water.

- In a cross involving self-fertilized F_1 plants that Mendel observed for segregating of yellow and green seed colour show the following results: 10

Yellow seeds – 428

Green seeds – 125

Perform the χ^2 test for goodness of fit for the most suitable null hypothesis (χ^2 at $p = 0.05$ for 1 degree of freedom is 3.84). What is the alternative hypothesis here?

—x—