



‘समानो मन्त्रः समितिः समानी’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2022

DSE-P1-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 DSE2. 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 do you mean by freeze etching?
 - (b) Define radioisotope.
 - (c) What do you mean by Arithmetic mean?
 - (d) What is meant by Resolving power of a microscope?
 - (e) What is an elution buffer?
 - (f) What is meant by electrophoretic mobility?
 - (g) What is cryofixation?
 - (h) What is column chromatography?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) Briefly describe the working principles of a compound microscope. What is Numerical Aperture? 4+1
 - (b) Distinguish between: 2½ × 2 = 5
 - (i) Primary data and Secondary data
 - (ii) Q-Banding and G-Banding of chromosome.
 - (c) What is Electrophoresis? What is the difference between Native-PAGE and SDS-PAGE? 3+2
 - (d) Briefly explain the application of Ion-exchange Chromatography. 5
 - (e) Write short notes on: 2½ × 2 = 5
 - (i) Measures of Central Tendency
 - (ii) SEM and TEM.

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Describe the working principle of NMR spectroscopy. What is the role of analyzer in mass spectroscopy? 8+2
- (b) What is meant by pulse-chase experiment? Mention the applications of this method. 7+3
- (c) What is Thin-layer Chromatography? What are its various components? Discuss the application of this technique. 2+4+4
- (d) Mention the principle of centrifugation. How is density used to separate DNA? 6+4

PAPER-2

BIOINFORMATICS

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) What is DBMS?
- (b) What is TAIR-BLAST?
- (c) What do you understand by pairwise alignment?
- (d) Give the full form of QSPR.
- (e) Name a scoring matrix that is used to score alignments between closely related sequences of amino acids.
- (f) The International Protein Sequence Database is a database found in which website?
- (g) Define analogy in phylogenetic studies.
- (h) What is Entrez?

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Write a note on the aim and scope of Bioinformatics. 2+3
- (b) What is the full form of DDBJ? How would you submit a sequence in DDBJ? 1+4
- (c) What is phenetics? Differentiate between the UPGMA and neighbour joining tree building methods used in phylogenetic studies. 1+4
- (d) Give an account on nucleotide sequence databases. 5
- (e) Write a short note on techniques in drug designing. 5

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Give a detailed account on the branches of bioinformatics. 10
- (b) What is NCBI? Give an account of the different tools of NCBI. 2+8
- (c) What is alignment? Differentiate between PSA and MSA. Explain how CLUSTAL omega creates alignments of sequences. 2+4+4
- (d) Explain the different applications of bioinformatics in microbial genomics and improvement of crops. 10

PAPER-3
STRESS BIOLOGY
GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) What is HSP101?
 - (b) State the function of Calmodulin.
 - (c) What are the signaling effects of MAPK?
 - (d) Name two cellular osmolytes.
 - (e) Define adaptation.
 - (f) What are Sciophytes?
 - (g) Name the antioxidant enzyme acting against superoxide free-radical.
 - (h) State the change observed in root : shoot ratio of plant adapted to water stress condition.

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Elucidate the phenomenon of Hypersensitive reaction. 5
 - (b) Discuss in brief the adaptive features of drought resistant plant. 5
 - (c) Discuss in brief IP3-DAG pathway. 5
 - (d) Differentiate between acclimation and adaptation. 5
 - (e) State the physiological changes in plants due to salinity stress. 5

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Describe the phospholipid signaling system in plants. 10
 - (b) Define temperature stress. State the symptoms of plant facing high temperature. 2+4+4
How do plants encounter chilling stress?
 - (c) Give an account of ROS production and scavenging mechanism. 10
 - (d) Write short notes on: 5+5
 - (i) Osmoprotectants
 - (ii) Function of Jasmonates.

PAPER-4
PLANT BREEDING
GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) What is domestication?
 - (b) What is the full form of NBPGR?
 - (c) Name two improved wheat varieties obtained by pure line selection method.
 - (d) What is poly cross?
 - (e) What is herkogamy?

- (f) What is backcross method of hybridization?
- (g) What is emasculation?
- (h) What is mutation breeding?

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Discuss the role of polyploidy in crop improvement. 5
 - (b) What is apomixis? What are the important applications of apomixis in plant breeding? 2+3
 - (c) What are the merits and demerits of pedigree method of hybridization? $2\frac{1}{2} \times 2 = 5$
 - (d) What is inbreeding depression? How does it differ from Hybrid Vigour? 2+3
 - (e) Write notes on: $2\frac{1}{2} \times 2 = 5$
 - (i) Centre of origin of crops
 - (ii) Monogenic Inheritance.

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Discuss the aim and objectives of plant breeding. What are the undesirable consequences of plant breeding? 6+4
 - (b) What is distant hybridization? Discuss the techniques used for successful distant hybridization. Explain the role played by distant hybridization in crop improvement. 2+4+4
 - (c) Write notes on: 5×2 = 10
 - (i) Contrivances for cross pollination
 - (ii) Application of heterosis in plant breeding.
 - (d) Differentiate between Pure-line selection and Mass-selection. Briefly describe the selection methods for vegetatively propagated plants. Discuss the advantages and limitations of hybridization method. 4+3+3

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Define the term 'Biodiversity'.
 - (b) What is biopiracy?
 - (c) What do you understand by desertification?
 - (d) What is the mandate of Ramsar Convention?
 - (e) What is an aquifer?
 - (f) What do you mean by ex-situ conservation?
 - (g) Name two biodiversity hotspots in India.
 - (h) What is geothermal energy?

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Write down the significance of bioprospecting in resource management. 5
- (b) Discuss the different types of cultural practices to conserve soil. 5
- (c) Write a note on Carbon footprint. 5
- (d) What is EIA? Describe the procedure in short. 1+4
- (e) What is silviculture? State the importance of silviculture. 1+4

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Discuss the threats and management strategies to conserve ground water. 5+5
- (b) Define the term bioprospecting. Briefly explain how does bioprospecting affect the environment. 2+8
- (c) Discuss the threats to biodiversity. What are the efforts taken by the government of India to conserve biodiversity? 6+4
- (d) What are the major and minor forest products? Describe with special reference to India. 10

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Define Bonsai.
- (b) Give the scientific name of any two ornamental flowering trees.
- (c) What do you mean by PGRs?
- (d) What is ecotourism?
- (e) Define biofertilizer with examples.
- (f) Mention two advantages of surface irrigation.
- (g) What are the main Mg-deficiency symptoms in horticultural crops?
- (h) Name two cut flowers (Scientific names) of high demand in Indian market.

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Mention botanical name and family of poppy. Write down the salient features of poppies. 2+3
- (b) Give an account of essential features of ornamental plant for parks. 5
- (c) Write a short note on biopesticides. 5
- (d) Discuss the role of horticulture in rural economy and employment generation. 5
- (e) Write a short note on hydroponics and its application. 5

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Discuss the role of micropropagation and tissue culture technique in the conservation of germplasm. 10
 - (b) What do you mean by landscaping? Mention the principles of landscaping. 2+8
 - (c) Write an essay on importance of flower show and exhibition in horticultural practice. 10
 - (d) Give a detail account of post-harvest technology and its importance in horticulture. 10

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

1. Answer any *five* questions: 1×5 = 5
- (a) Define one molal solution.
 - (b) Name one model organism for study of animal genetics.
 - (c) Define squash preparation.
 - (d) Name one basic dye.
 - (e) Explain 'fluorochrome'.
 - (f) Define copyright.
 - (g) What is the use of tissue dehydration?
 - (h) Name one carcinogenic chemical.

GROUP-B

2. Answer any *three* questions: 5×3 = 15
- (a) Compare and contrast quantitative vs qualitative research.
 - (b) Describe the steps in preparation of 40(N) solution of NaOH.
 - (c) Write a short note on field research.
 - (d) Give a brief account of safety measures in handling toxic chemicals.
 - (e) What are presently the key biology research areas?

GROUP-C

3. Answer any *two* questions: 10×2 = 20
- (a) Where do you use microtome? Describe procedure for preparing the paraffin block with the material. 2+8
 - (b) Classify the various stains based on their chemistry. Enlist the essential staining equipment. 5+5
 - (c) How is it possible to prepare living tissue for microscopic study? Differentiate between physical and chemical fixation. 5+5
 - (d) What are the various methods for tabular and graphical presentation of data? What is microphotography? How does it differ from field photography? 4+2+4

PAPER-8

INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) What is the use of baffles in a fermentor?
 - (b) Explain 'pilot scale' fermentor.
 - (c) What is the purpose of spray-drying?
 - (d) What is the safe TDS for drinking water?
 - (e) Define 'in-situ' bioremediation.
 - (f) Name one species of starch-hydrolyzing microorganism.
 - (g) Give full form of VAM.
 - (h) Name one water borne human pathogenic bacteria.

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Describe the large-scale application of immobilized enzyme technique.
 - (b) Briefly describe the mycorrhizal colonization of plant roots. 5
 - (c) Write a short note on coliforms as indicators of water quality.
 - (d) Describe the process of industrial production of citric acid. Mention two uses of citric acid. 4+1
 - (e) Describe in brief batch fermentation with emphasis on its advantages.

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Describe the different techniques used for filtration and cell disruption for product recovery. 5+5
 - (b) Explain the process of domestic waste water treatment system with emphasis on the microbial groups involved. Give flowchart. 10
 - (c) Differentiate between:
 - (i) Solid state and liquid state fermentation
 - (ii) Downstream and upstream processing.
 - (d) Describe isolation process of microorganisms from soil and water.

PAPER-9

BIOSTATISTICS

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) What is random sampling?
 - (b) In a series of samples consisting of 27 observations arranged in ascending order, value of which variable will be median?
 - (c) Give the formula for the relationship between mean, mode and median.
 - (d) What is the formula for t-test calculation?
 - (e) What is alternative hypothesis?
 - (f) What is a bar diagram?
 - (g) What is coefficient of standard deviation?

- (h) If two variables do not show any correlation in correlation analysis, is it possible to do regression analysis?

GROUP-B

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

- (a) Define standard deviation. Discuss its merits and demerits and uses of standard deviation. 2+3

- (b) According to height, 200 jute plants can be grouped as: 5

Frequency	10	30	75	50	30	5
Class value	60	62	64	66	68	70

Calculate the mean height and the mean deviation.

- (c) The lengths of young seedlings of two varieties of mango are as follows: 5

A	35	23	47	17	10	43	09	06	28
B	30	33	45	23	08	49	12	04	31

Compute their ranks and coefficient of correlation.

- (d) Define regression. Discuss different types of regression. 1+4

- (e) What is chi-square test? State its characteristic features. What is null hypothesis? 2+2+1

GROUP-C

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

- (a) Compute the mean and SD of the following distribution: 5+5

Class Interval	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Frequency	2	4	2	6	8	10	12	20	16

- (b) In a Mendelian experiment on breeding, four types of plants are expected to occur in the proportion of 9:3:3:1. The observed frequencies are: 891 round and yellow, 316 wrinkled and yellow, 290 round and green and 119 wrinkled and green. Find the chi-square value and examine the correspondence between the theory and the experiment. [The tabulated χ^2 value at 5% level of probability is 7.80 for 3 degrees of freedom] 10

- (c) From the following results, obtain the two regression equations and estimate the yield of crops when the rainfall is 22 cms. The amount of 9 cms rainfall yield 600 kg. 10

Variable	Yield in kg (Y)	Rainfall in cm (X)
Mean	508.4	26.7
SD	36.8	4.6

Coefficient of correlation between yield and rainfall = 0.52.

- (d) Find out the Karl Pearson's coefficient of correlation of the following data: 10

A	14	19	21	26	22	15	20	19	24
B	31	36	37	50	45	33	41	39	48

—x—