



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2023

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
- State the role of marker enzymes in cell fractionation.
 - What is the role of buffer in gel electrophoresis?
 - What is variance?
 - Which law is applicable in spectrophotometry?
 - What are TEM and SEM?
 - What is the full form of ELISA?
 - Mention the stationary and mobile phase of TLC.
 - Define centrifugation.

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- Discuss the role of radioisotopes in biological research. 5
 - State the working principle of ion-exchange chromatography. Mention two applications and two limitations of the ion-exchange chromatography method. 1+2+2
 - Differentiate between: 2½ × 2 = 5
 - Mean and Mode
 - Paper Chromatography and TLC.
 - Write short notes on: 2½ × 2 = 5
 - PAGE
 - Fluorescence microscopy.
 - 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.

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) What is blotting? Explain the technique of southern blotting in detail, with the help of labelled diagram. 2+8
 - (b) Differentiate between: 5+5
 - (i) Freeze etching and Freeze fracturing
 - (ii) Differential and Density gradient centrifugation.
 - (c) Write short notes on: 5+5
 - (i) Chi-square test for goodness of fit
 - (ii) Measures of central tendency.
 - (d) Write an account on chromosome bonding technique. Mention its applications. 6+4

PAPER-2

BIOINFORMATICS

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- (a) Explain the term FASTA.
 - (b) What is RDBMS?
 - (c) What is database?
 - (d) What is the utility of PASC?
 - (e) Define Pairwise Sequence Alignment.
 - (f) Expand the term DDBJ.
 - (g) State one difference between KEGG and Reactome.
 - (h) Define the term 'bioinformatics'.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) What is BLINK? Distinguish between local alignments and global alignments. 1+4
 - (b) Write a note on the applications of bioinformatics in drug designing. 5
 - (c) What are the major resources of EMBL? 5
 - (d) Explain the concepts of bootstrapping and jackknifing. 5
 - (e) Write short notes on: 2½+2½
 - (i) PIR
 - (ii) BLOSUM.

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) What is phylogenetic analyses? Mention some methods of studying molecular phylogeny. What do you mean by 'Consistency of Molecular Phylogenetic Predictions'? 3+3+4
 - (b) Differentiate between sequence analyses and structural analyses in bioinformatics. What is drug discovery? 7+3
 - (c) Write short notes on: 5+5
 - (i) Scoring matrices
 - (ii) Architecture of BLAST.
 - (d) Give an account of the classification and significance of biological databases. 5+5

PAPER-3
STRESS BIOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What is the function of SOD?
 - Name two plant hormones involved in stress management.
 - What is MAPK enzyme?
 - Define glycophytes.
 - What are osmolytes? Give one example.
 - Give example of two PR proteins.
 - Define physiologically dry soil.
 - What is adaptation?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Briefly describe the effects of cold stress on plants. 5
 - Elucidate the scavenging mechanism of ROS. 5
 - Write short notes on: 2½ + 2½
 - Hypersensitive reactions
 - Role of salicylic acid in biotic stress.
 - Enumerate the adaptive features of saline resistant plants. 5
 - How does SAR operate in plants? 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Describe the mediation of insect and disease resistance by jasmonates. 10
 - What is calcium modulation? Name the organelles where calcium is stored. 2+1+7
Briefly describe the mechanism of calcium modulation.
 - Write short notes on: 5+5
 - Antioxidant enzyme system
 - Phytoalexins.
 - Give an account on pathogenesis related (PR) proteins with reference to their role in plant defence mechanism. 10

PAPER-4
PLANT BREEDING

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- Define polyploidy.
 - What are molecular markers?
 - Give an example of inbreeding depression.
 - What is layering?
 - What is epistasis?
 - Name two chemical mutagens.
 - Name one plant product that has genes of bacterium.
 - Name two cross pollinated crops.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- What is inbreeding depression? Mention its demerits. 5
 - What are polygenes? Discuss briefly how polygenic inheritance affect genetic diversity in a population. 1+4
 - Define vegetative propagation. State the advantage of vegetative propagation. 2+3
 - Mention the role of biotechnology in crop improvement. 5
 - Discuss in detail the interspecific hybridization technique.

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Write short notes on:
 - Monogenic inheritance
 - Cytoplasmic Male Sterility.
 - What is hybridization? Briefly describe the role of hybridization in crop improvement. 2+8
 - What is meant by plant genetic resources? Mention the important achievements and undesirable consequences of plant breeding. 2+8
 - Write differences between: 5+5
 - Pedigree method and Bulk method
 - Dominance hypothesis and over-dominance hypothesis.

PAPER-5**NATURAL RESOURCE MANAGEMENT****GROUP-A**

1. Answer any **five** questions from the following: 1×5 = 5
- Give the full name of GIS.
 - What is IPR?
 - What is carbon footprint?
 - What is β -diversity?
 - Define Estuary.
 - What is resource accounting?
 - What do you mean by natural resource?
 - What is meant by Ramsar site in India?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- What is CBD? Discuss the role of CBD in addressing Wild Life issues. 1+4
 - Write a short note on Bioprospecting. 5
 - Differentiate between Renewable and Non-renewable energy. What are meant by major and minor forest products? 2+3
 - Suggest a few useful ways of utilizing waste water. 5
 - Write the major urban problems related to energy. What do you mean by energy crisis? 4+1

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Give the full form of EIA. Explain in brief various steps and processes of EIA. 1+9

- (b) What are Wetlands? Write their importance. Mention two Wetlands of India identified as Ramsar Sites. 2+6+2
- (c) What are the causes of soil degradation? Write a short note on management of soil degradation. 5+5
- (d) What are the ecological services provided by forests? How the socio-economic activity results in forest depletion? 5+5

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What is urban forestry?
 - Name one weedicide.
 - Name one ornamental flowering tree.
 - What is surface irrigation?
 - Write the full form of IPR.
 - How does Ancient Indian garden differ from European garden?
 - Write down the botanical name and family of Areca palm.
 - Name two common post harvest disease of local fruits.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Discuss about different diseases and pests of ornamental plants. 5
 - Write short notes on: $2\frac{1}{2} + 2\frac{1}{2}$
 - Border irrigation
 - Bonsai.
 - Mention few advantages and disadvantages of food irradiation. $2\frac{1}{2} + 2\frac{1}{2}$
 - Define Eco-tourism. Write the role of Eco-tourism in urban horticulture. 1+4
 - Write about the importance of flower shows and exhibitions in the field of horticulture. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Define biofertilizer. What are the advantages of biofertilizer over chemical fertilizer? Write about the role of PGR's and Biopesticides in horticultural practices. 2+2+3+3
 - Write the scientific name and salient features of the following plants: $2\frac{1}{2} \times 4 = 10$
 - Carnations
 - Tuberose
 - Fishtail
 - Gulmohar.
 - Discuss about different post-harvest technologies and their role to minimize losses during storage and transport. 10
 - Describe the role of micropropagation and tissue culture in horticulture. 5+5

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- Define molal solution.
 - What is Analytical Grade Reagent?
 - Give one example of non-coagulant fixative.
 - What is plagiarism?
 - Write the full form of GFP.
 - Give example of acidic dye.
 - What is tissue maceration?
 - What is a 'squash'?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Distinguish between quantitative and qualitative research. 5
 - Write a note on common toxic chemicals used in the biological laboratory and safety measures in their handling. 5
 - Give an account on squash preparation method. 5
 - Mention the rationale behind dehydrating tissue section through graded solvent series. 5
 - Give an outline about the writing of references in a scientific Journals. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Write short notes on: 5+5
 - Model Organisms in Biology
 - Library Research.
 - Define reactive dyes with some examples. Classify stains based on their chemistry. Explain the utility of the PowerPoint presentation in a scientific conference. 2+3+5
 - Distinguish between: 5+5
 - Coagulating fixative and non-coagulating fixative
 - Field research and laboratory research.
 - What do you mean by whole mount? How is it different from the peel mount? Define molarity. Describe the process of preparation of 3(M) solution of KNO_3 . 2+2+1+5

PAPER-8

INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What is a fluidized bed bioreactor?
 - What is the function of leghemoglobin?

- (c) Why tower fermenter is used?
- (d) What causes high COD in water?
- (e) Define bioremediation.
- (f) What is the full form of VAM?
- (g) What is CFU?
- (h) Mention one industrial application of penicillin acylase.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) What do you mean by fermentation? Write a short note on liquid-state fermentation. 2+3
 - (b) Discuss briefly the different components of a typical bioreactor. 5
 - (c) Describe a method for isolation of root nodule bacteria. 5
 - (d) Discuss role of microbes in bioremediation of contaminated soil. 5
 - (e) Differentiate between: 2½+2½
 - (i) BOD and COD
 - (ii) Batch fermentation and continuous fermentation.

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) What are the industrial uses of citric acid and glutamic acid? Describe the fermentation conditions for penicillin production. 4+6
 - (b) Differentiate between batch and continuous culture. Discuss briefly the construction of an aerobic fermenter with proper diagram. 2+8
 - (c) Write short notes on:
 - (i) Micro-organism as indicators of water quality
 - (ii) Arbuscular mycorrhizal colonization in plant roots.
 - (d) Discuss in detail mechanism of biological Nitrogen fixation. 10

PAPER-9

BIOSTATISTICS

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- (a) What is the meaning of 't' test?
 - (b) What is meant by secondary data?
 - (c) What does a large value of standard deviation indicate?
 - (d) What is frequency polygon?
 - (e) What is meant by null hypothesis?
 - (f) What is ANOVA?
 - (g) What is regression line?
 - (h) What is sampling error?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) What are data? Differentiate between quantitative and qualitative data. 1+4
- (b) Distinguish between: $2\frac{1}{2} + 2\frac{1}{2}$
- (i) Correlation and Regression
- (ii) Mean and Mode.
- (c) Define the term standard deviation with the help of suitable example. Show the method of calculating it. 3+2
- (d) What is central tendency? Distinguish between geometric mean and arithmetic mean. 2+3
- (e) Prepare a pie diagram with following F₂-data of a hybridization experiment: 5
- Yellow and smooth seeds - 75
- Yellow and wrinkled seeds - 20
- Green and smooth seeds - 10
- Green and wrinkled seeds - 10

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) Write short notes on:
- (i) Histogram
- (ii) Limitations of biostatistics.
- (b) Grain lengths of two varieties of rice are given below. Calculate mean, standard deviation and standard error of grain length of two varieties. 10

Variety A		Variety B	
Grain length (mm)	No. of grains	Grain length (mm)	No. of grains
9-11	3	9-11	0
12-14	5	12-14	8
15-17	9	15-17	8
18-20	3	18-20	4

- (c) The average number of fruits borne by the tree in the past was 100. This time the number of fruits borne by 15 trees after the supplementation of a fertilizer was as follows: 10
- 90, 110, 95, 120, 150, 130, 90, 140, 130, 140, 150, 125, 145, 155, and 100
- Perform a t-test to test whether the fertilizer is effective in increasing the number of fruits borne by the trees (Given, value of $t = 1.761$ at 14 degree of freedom).
- (d) In F₂ generation, Mendel obtained 621 tall plants and 187 dwarf plants out of the total of 808. Test whether these two types of plants are in accordance with Mendelian monohybrid ratio of 3:1 or that they deviate from this ratio (at 1df $\chi^2_{\alpha=0.05} = 3.84$) 10

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‘समानो मन्त्रः समितिः समानी’

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PAPER-1

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Write about an application of FISH.
 - (b) Name two marker enzymes.
 - (c) What do you mean by resolving power of a microscope?
 - (d) What is an elution buffer?
 - (e) What is cryofixation?
 - (f) Define radioisotope.
 - (g) State the difference between absorbance and transmission.
 - (h) Give the full form of HPLC.

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) State the principle of electrophoresis. Mention different types of electrophoretic techniques. 3+2
 - (b) State the differences between transmission and scanning electron microscopy. 5
 - (c) Write short notes on: 2½+2½
 - (i) Shadow casting
 - (ii) Measures of central tendency.
 - (d) Define autoradiography. Discuss in detail pulse-chase experiment. 1+4
 - (e) What is negative staining? Give a note on use and application of negative staining. 1+4

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Define chromatography. State the differences between HPLC and TLC. 2+8

- (b) Write short notes on: 5+5
 (i) SDS-PAGE
 (ii) X-ray crystallography.
- (c) What do you mean by measures of dispersion? What are the objectives of measures of dispersion? Mention about different kinds of measures of dispersion. 1+2+7
- (d) Discuss in detail about differential centrifugation. How is density used to separate DNA? 5+5

PAPER-2

BIOINFORMATICS

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What is biological database?
 - What does BLOSUM stand for?
 - What is DDBJ?
 - Why bioinformatics is regarded as an inter-disciplinary subject?
 - Cite one example of Protein database.
 - Name one software used for molecular phylogenetic analysis.
 - Define PAM.
 - What is QSAR technique?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Write a note on the aim and scope of bioinformatics. 5
 - What are the salient features of Swiss-Prot? Write down the sequential steps of data retrieval in PIR through flowchart. 2+3
 - Define phylogeny. Draw a comparison between ML and NJ methods of phylogeny. 1+4
 - Differentiate between PSI-BLAST, PHI-BLAST, and DELTA-BLAST. Elucidate the term 'blastp'. 3+2
 - Discuss the classification format of biological databases. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- What do you mean by multiple-sequence alignment (MSA)? How does it occur through CLUSTAL W? Write a short note on Scoring Matrices. 2+5+3
 - Write down the different branches of bioinformatics. Discuss the applications of bioinformatics on drug discovery and crop improvement. 2+4+4
 - Give a detailed account on various sequence analysis tools of EMBL database. Write down the sequential steps of sequence submission to EMBL. 5+5
 - What do you mean by consistency of molecular phylogenetic prediction? Briefly explain. Write a short note on gene-expression database. 5+5

PAPER-3
STRESS BIOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- Give two examples of PR proteins.
 - Write the full form of 'SAR'.
 - Name any one example of "ROS".
 - What is resistance?
 - What are Sciophytes?
 - Name one cellular osmolytes.
 - What are antioxidants?
 - Name one calcium modulation protein in plant.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Discuss the mechanism of phospholipid signaling. 5
 - Write notes on: $2\frac{1}{2} + 2\frac{1}{2}$
 - Hypersensitive reaction
 - Psychrophytic plants.
 - Discuss the role of compatible solutes in plants during stress management. 5
 - Write notes on adaptive features of saline resistance plants. 5
 - Differentiate between the physical and physiological defense mechanism in plants. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Give an account on "ROS" production and their scavenging mechanism. 10
 - Define temperature stress. State the symptoms of plant facing high temperature. 2+4+4
How do plants encounter chilling stress?
 - Write short notes on: 5+5
 - Adaptive features of Xerophytes
 - Calcium signaling.
 - Give an account on phytoalexins with special reference to their role in plant defence mechanism. 10

PAPER-4
PLANT BREEDING

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What do you mean by Primary introduction?
 - Name two vegetatively propagated crop plant.
 - Define germplasm.
 - Define the term acclimatization.
 - What is grafting?

- (f) Define mass selection.
- (g) What is amphidiploid?
- (h) Define clone.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) What do you mean by plant breeding? What are the objectives and undesirable consequences of plant breeding? 2+3
 - (b) Explain various advantages and limitations of hybridization in crop improvement. $2\frac{1}{2}+2\frac{1}{2}$
 - (c) Define heterosis. Explain the dominance hypothesis of heterosis. 1+4
 - (d) Write a note on allo-polyploidy in crop improvement. 5
 - (e) Compare between Pure line selection and mass selection. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) Distinguish between pollen bank and seed bank. Mention their applications in crop improvement. 5+5
 - (b) Write short notes on: 5+5
 - (i) Role of mutation in plant breeding
 - (ii) Role of biotechnology in crop improvement.
 - (c) Differentiate between qualitative and quantitative inheritance. Briefly explain the phenomenon of quantitative inheritance citing one proper example. 3+7
 - (d) Discuss the impact of polyploidy in crop improvement and breeding. Describe the pedigree method of plant breeding. 6+4

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- (a) Define fossil fuel.
 - (b) Give the full form of "GIS".
 - (c) What is Red Data Book?
 - (d) What are geothermal energy?
 - (e) Define Estuary.
 - (f) What is Ramsar Site?
 - (g) What is bio-prospecting?
 - (h) What is forest cover?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) Discuss the advantages and disadvantages of using non-renewable resource of energy. $2\frac{1}{2}+2\frac{1}{2}$
 - (b) Write short notes on: $2\frac{1}{2}+2\frac{1}{2}$
 - (i) Ecological Footprint
 - (ii) Silviculture.

- (c) What are the various strategies that can be taken for the conservation of water resources? 5
 (d) What is sacred-grove? Briefly describe the role of sacred-grove in the conservation of Biodiversity. 1+4
 (e) State the importance of Ex-situ conservation. 5

GROUP-C

3. Answer any **two** questions from the following: $10 \times 2 = 20$
 (a) What is the significance of EIA in resource management? What are the impacts of waste materials on Environment? 6+4
 (b) Discuss the threats to biodiversity. What are the efforts taken by the Government of India to conserve biodiversity? 6+4
 (c) Write notes on: 5+5
 (i) Role of GIS in biodiversity
 (ii) Causes of Forest depletion.
 (d) Discuss the different types of cultural practices to conserve soil. 10

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

1. Answer any **five** questions from the following: $1 \times 5 = 5$
 (a) What is ecotourism?
 (b) Name two weed control chemical agents.
 (c) Mention two salient features of *Opuntia*.
 (d) Define budding.
 (e) What do you mean by seed propagation?
 (f) Name two varieties of *Citrus*.
 (g) Distinguish between annuals and perennials.
 (h) What is Biopesticide?

GROUP-B

2. Answer any **three** questions from the following: $5 \times 3 = 15$
 (a) Write a short note on gardening traditions of ancient India. 5
 (b) Briefly discuss the importance of flower shows and exhibitions in the field of floriculture. 5
 (c) Discuss the role of micropropagation and tissue culture techniques in the conservation and management of horticultural crops. 5
 (d) Mention two varieties of mango and state their identifying features. $2 \frac{1}{2} + 2 \frac{1}{2}$
 (e) Define PGR. Briefly discuss the application of different PGRs in horticultural practices/techniques. 1+4

GROUP-C

3. Answer any **two** questions from the following: $10 \times 2 = 20$
 (a) What is hydroponics? Give an outline of the techniques of hydroponics. Discuss the advantages of this technique. 2+6+2

- (b) Write the salient features of the following Ornamental plants: 3+3+3+1
 (i) Orchids
 (ii) Gerberas
 (iii) Tuberose
 Mention two examples of Ornamental flowering trees.
- (c) Discuss the various irrigation methods used in horticultural techniques. 10
- (d) Write short notes on: 5+5
 (i) Crop sanitation
 (ii) Food irradiation.

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What do you mean by “model organism”?
 - What is empirical research?
 - What is gene flow?
 - State one application of GFP.
 - What is peel mounting?
 - Name one toxic material used in laboratory.
 - Define fluorochrome.
 - Name one permanent mounting material.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Distinguish between quantitative and qualitative research. 5
 - Classify different categories of stains and comment on their chemical nature. 5
 - Give an account of scientific writing and its ethics. 3+2
 - Mention the rationale behind dehydrating tissue sections through graded solvent series. 5
 - Define molarity. Calculate the molarity of 20% of NaOH solution. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Why tabulation is considered essential in a research study? State the characteristics of a good table. Name some common graphs used for data interpretation. 3+5+2
 - Name one physical and chemical fixative. Give a detailed account on the preparation of tissue for thin and ultrathin sections. 2+8
 - Write short notes on: 5+5
 (i) Model organisms in Biology
 (ii) Safety measures in laboratory.
 - Distinguish between: 5+5
 (i) Genomics and proteomics
 (ii) Coagulating and non-coagulating fixative.

PAPER-8

INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What is a crude media?
 - What is activated sludge?
 - Name one starch hydrolysing bacterium.
 - What is the use of baffles in a fermenter?
 - Name two soil inhabiting bacteria.
 - What is the purpose of spray drying?
 - What causes high BOD in water?
 - What is inoculum?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Differentiate between batch and continuous culture. What do you understand by ideal production media? 3+2
 - Describe the method of industrial production of glutamic acid. 5
 - Briefly describe the isolation process of microbes from soil sample. 5
 - Discuss in brief the alternative methods available for the mass culture of microorganisms in industrial process. 5
 - Write notes on: 2½+2½
 - Glucose isomerase
 - TDS.

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- What is biological N₂-fixation? Discuss the components and role of nitrogenase complex enzyme. Discuss the symbiotic relationship between *Rhizobium* and Leguminous plants. 2+2+2+4
 - How is a coliform defined? How does one differentiate between coliform and fecal coliform in the laboratory? In what type of environment is it better to use fecal enterococci rather than fecal coliforms as an indicator and why? State the advantages and disadvantages of membrane filter for microbiological examinations of water. 2+2+2+4
 - Distinguish between solid state and liquid state fermentation. What is bioreactor? Describe the structure and working principle of airlift fermenter. 4+2+4
 - What is immobilization of enzymes? What are the advantages and application of immobilized enzymes in food industry? 3+7

PAPER-9

BIOSTATISTICS

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- What is frequency distribution?
 - Find out the median of 25, 15, 23, 40, 27, 25, 23, 25 and 20.

- (c) What is null hypothesis?
 (d) What is a regression line?
 (e) Define histogram.
 (f) Define statistical error.
 (g) The co-efficient of variation is 40 and the mean is 30. Find the standard deviation (S.D.).
 (h) What is the formula for t-test calculation?

GROUP-B

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

5×3 = 15

- (a) Briefly discuss the various methods of sampling in statistical study. 5
 (b) What is chi-square test? State its characteristic features. What is degree of freedom? 2+2+1
 (c) Write a short note on presentation of data. 5
 (d) Calculate the mode from the following data recorded on mutants in barley. 5

No. of mutants	7	8	9	10	11	12	13	14	15	16	17	18
No. of plants	47	52	56	60	63	64	65	50	52	41	57	64

- (e) Write a short note on student's t-test. 5

GROUP-C

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

10×2 = 20

- (a) In a F_2 population of Finger Millet, the breeder observed 603 plants of grey coloured seeds and 217 plants of red coloured seeds. Perform a chi-square test to test the goodness of fit of the observed values with 3:1 ratio and comment. 10
 (b) Grain length of two varieties of rice are given below. Calculate the mean, standard error and C.V. of grain length of the two varieties. 10

Variety A		Variety B	
Grain Length (mm)	No. of grains	Grain Length (mm)	No. of grains
9-11	3	9-11	0
12-14	5	12-14	8
15-17	9	15-17	8
18-20	3	18-20	4

- (c) Summarize the raw data for plant height of 30 plants of *Vigna radiata* given below in a frequency distribution table and draw a frequency polygon for the same. 6+4

143	138	121	139	133	151	119	133	122	123
136	104	112	121	132	137	104	126	90	134
132	107	112	123	99	126	113	140	127	129

- (d) Find out 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—



‘সমানো মন্ত্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2023

CC11-BOTANY

REPRODUCTIVE BIOLOGY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Who is the father of Indian plant embryology?
 - (b) Name one gene for flower development in angiosperms.
 - (c) What is protandry? Give an example.
 - (d) Mention the role of jaculators in seed dispersal.
 - (e) Name one plant with cleistogamous flower.
 - (f) What is gynostegium?
 - (g) Give one example of bisporic embryo sac.
 - (h) What is egg apparatus?

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Briefly discuss the scope of palynology. 5
 - (b) Write the adaptive features of flowers for cross-pollination. 5
 - (c) Briefly discuss the process of double fertilization with a suitable diagram. 5
 - (d) Write an account on apomixis. 5
 - (e) What do you mean by megasporogenesis? Write in brief about bisporic and tetrasporic megasporogenesis.

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Elaborate the ABC model of flower development with suitable diagram. 10
 - (b) What is endosperm? Mention its importance. Write a note on different types of endosperm with examples. 1+2+7
 - (c) Write short notes on: 5+5
 - (i) Parasexual hybridization
 - (ii) *Invitro* fertilization.
 - (d) Write the different methods of seed dispersal in plants with a suitable diagram and example. 10

—x—



‘समानो मन्त्रः समितिः समानी’

UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 5th Semester Examination, 2023

CC12-BOTANY

PLANT PHYSIOLOGY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- Define water potential.
 - Name one naturally occurring cytokinin.
 - What is the triple response of ethylene?
 - What is symplast?
 - Give one example of chelating agent.
 - What is devernalization?
 - Define facilitated diffusion.
 - Distinguish between passive and active absorption.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Mention the physiological roles of calcium and phosphorus in plants. 2½+2½
 - Why is water potential of a cell is always negative? Water potential of a cell is 0.244 MPa and pressure potential is 0.402 MPa. Calculate the osmotic potential of that cell. What is the water potential of pure water at standard temperature? 1+3+1
 - Discuss the role of ABC transporters in ionic transport. What is solute potential? 4+1
 - Write short notes on: 2½+2½
 - Critical day length
 - Red and far-red light responses of plants.
 - Give a brief account of phloem loading and unloading. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- What do you mean by photoperiodic induction? What is the site of perception of the photoperiodic stimulus? Discuss in brief the role of GA in flowering. Write the scientific names of one short day plant and one long day plant. 2+2+4+2
 - What are cytokinins? Describe briefly the occurrence and movement of cytokinins. 2+3+5
 - What is phytochrome? Discuss its chemical nature and its role in photomorphogenesis. 2+4+4
 - Differentiate between transpiration and guttation. Discuss the vital theories in relation to ascent of sap. 3+7

—x—