



'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 6th Semester Examination, 2022

DSE-P3-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 DSE4. 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) Which fluorescent dye can be used for red fluorescence? 1
 - (b) What is the role of buffer in gel electrophoresis? 1
 - (c) What is variance? 1
 - (d) Define Beer-Lambert Law. 1
 - (e) What are the factors affecting column efficiency? 1
 - (f) How population mean differs from sample mean? 1
 - (g) What are the wavelengths used for proteins in spectrophotometer? 1
 - (h) Why salts of heavy metals are used as stain in electron microscopy? 1

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) With the help of a diagram explain the principle of affinity chromatography. 5
 - (b) Discuss the role of radioisotopes in biological research. 5
 - (c) Explain the working of spectrophotometer. Mention its applications. 3+2
 - (d) In the Mendelian dihybrid cross, following result was observed 5
 - (i) Round Yellow seeds = 310
 - (ii) Round Green seeds = 107
 - (iii) Wrinkled Yellow seeds = 101
 - (iv) Wrinkled Green seeds = 32Calculate the Chi-square (χ^2) and interpret the result.
 - (e) Differentiate between AGE and PAGE. 5

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Define data. What are different forms of data? Discuss about different types of data representation. 1+2+7
- (b) Write an account of chromosome banding technique. Mention the applications of this techniques. 6+4
- (c) Discuss the working principle, application and limitations of ion-exchange chromatography. 4+3+3
- (d) Using a ray diagram explain the working of an electron microscope. Differentiate between SEM and TEM. 6+4

PAPER-2

BIOINFORMATICS

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Define biological database. 1
- (b) What is the full form of NCBI? 1
- (c) What is PSA? 1
- (d) Define phylogeny. 1
- (e) What do you understand by Quantitative structure activity relationship? 1
- (f) Distinguish between software and database. 1
- (g) Explain the term structural bioinformatics. 1
- (h) What is PIR? 1

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) What are the aims and scope of bioinformatics? 5
- (b) Explain the term ‘Scoring matrices’ with special emphasis on PAM and BLOSUM. 5
- (c) Give a brief description of the biological database retrieval system. 5
- (d) What are the various softwares used in phylogenetic analyses? 5
- (e) Write a short note on DDBJ. 5

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Give an account of the different databases of NCBI, with special emphasis on nucleotide, protein and gene expression databases. 4+2+2+2
- (b) Give an account of the resources and databases of PIR. 5+5
- (c) What is molecular phylogeny? By what methods is it measured? Explain — ‘Consistency of Molecular Phylogenetic Prediction’. 2+4+4
- (d) Write short notes on: 5+5
- (i) Branches of Bioinformatics
- (ii) Application of Bioinformatics in Crop Improvement.

PAPER-3
STRESS BIOLOGY
GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Define adaptation. 1
 - (b) Name two phytoalexins along with their plant source. 1
 - (c) Define compatible osmolytes with examples. 1
 - (d) Name the antioxidant enzymes acting against peroxide radical. 1
 - (e) What are PR proteins? Give examples. 1
 - (f) How does halophyte differ from glycophyte? 1
 - (g) Give the full form of HR and SAR. 1
 - (h) Give an example of salt resistant plant. 1

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Discuss the role of jasmonate in biotic stress management. 5
 - (b) Briefly discuss the adaptive features of drought resistant plant. 5
 - (c) Write a note on Hypersensitive Reaction. 5
 - (d) Give an account on phytoalexins with special reference to their role in plant defence mechanism. 5
 - (e) Describe the mechanism of IP3-DAG pathway. 5

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) What is chilling stress? Discuss the various adaptations observed in plant against heat and cold stress. 2+4+4
 - (b) Describe systemic acquired resistance with suitable diagram. 10
 - (c) Give an account on ROS production and their effect on plant cellular system. 10
 - (d) Write short notes on: 5+5
 - (i) Osmotic adjustment
 - (ii) Calcium Signalling.

PAPER-4
PLANT BREEDING
GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Define polyploidy. 1
 - (b) Name two cross pollinated crops. 1
 - (c) What is monogenic inheritance? 1
 - (d) Mention a suitable selection process for vegetatively propagated plants. 1

- (e) Application of heterosis. 1
- (f) Define selection process. 1
- (g) Give an example of Inbreeding depression. 1
- (h) What is epistasis? 1

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) What is heterosis? Explain dominance hypothesis of heterosis. 1+4
 - (b) What is inbreeding depression? Mention its demerits. 5
 - (c) Describe the role of mutations in crop improvement. 5
 - (d) Define vegetative propagation. State the advantage of vegetative propagation. 2+3

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) What is quantitative inheritance? Briefly explain quantitative inheritance of kernel colour in wheat. 2+8
 - (b) What is hybridization? Briefly describe the role of hybridization in crop improvement. 2+8
 - (c) Elucidate the procedure, advantage and limitations of cross pollination. 10
 - (d) Give an account on the important achievements and undesirable consequences of plant breeding. 10

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) What is "Invasive species"?
 - (b) Name two biodiversity hotspots in India.
 - (c) What do you understand by 'Jhum cultivation'?
 - (d) Give the full form of WWF.
 - (e) Name two abiotic resources.
 - (f) What is desalination?
 - (g) What do you mean by flora and fauna?
 - (h) Give two examples of fossil fuel.

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Give a brief account of IPR. 5
 - (b) What is biodiversity? What is the significance of biodiversity? 1+4
 - (c) Distinguish between renewable and non-renewable resource of energy. 5

- (d) Write a short note on Chipko movement. 5
(e) Write down the different strategies for water conservation. 5

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) What is the significance of EIA in resource management? Describe the correlation between ecological footprint and carbon footprint. 5+5
- (b) Write short notes on: 5+5
- (i) Sustainable utilization
- (ii) GIS in biodiversity study.
- (c) What are the strategies for management of agricultural waste products? Briefly describe the major threats of soil degradation. 5+5
- (d) Distinguish between ex-situ and in-situ conservation. Write a note on forest depletion and its management. 3+7

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Name two ornamental climbers. 1
- (b) Write down two varieties of banana available in Indian fruit market. 1
- (c) Mention two common post-harvest diseases of horticultural crops. 1
- (d) What is the botanical name of 'fish-tail palm' and to which family does it belong? 1
- (e) What do you mean by drip irrigation? 1
- (f) Mention two methods of conservation of germplasm of horticultural crops. 1
- (g) Differentiate between cultivars and varieties. 1
- (h) Mention two basic features of Japanese gardens. 1

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Write short note on 'Role of horticulture in rural economy and income generation'. 5
- (b) Discuss about the salient features of Gulmohar along with its botanical name and families. 3+2
- (c) Write an essay on weed control measures in horticultural practices. 5
- (d) How can the self-life of cut flowers be extended? 5
- (e) What do you mean by plant-quarantine? Discuss about different methods of plant quarantine. 1+4

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Discuss about the application of manure and fertilizers in horticulture. Mention the precautions which should be taken during manuring. 8+2
- (b) Explain the role of flower show and exhibition in horticultural practices. 10
- (c) Discuss about different methods of pests-management of horticultural crops. 10
- (d) What is micropropagation? Discuss about the role of micropropagation in modern day Horticulture. 2+8

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- (a) Name an instrument used for preparation of ultra-thin section.
- (b) What is molarity?
- (c) Name a chemical used to arrest the cell division.
- (d) What is the difference between dye and stain?
- (e) What do you mean by 'empirical research'?
- (f) Write down the full form of GFP.
- (g) Give an example of basic dye.
- (h) What is the application of 'Scale bar'?

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- (a) Write a short note on copy-right. 5
- (b) Discuss about the differences between physical and chemical fixation of tissues. 5
- (c) What do you mean by academic-misconduct? Explain how it affects the scientific study. 2+3
- (d) What do you mean by literature review? Mention its importance in scientific study and research. 1+4
- (e) Mention the steps of squash preparation. Name a chemical which is used for tissue maceration. 4+1

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- (a) Describe the staining procedure to study the Vascular Bundle of angiospermic plants. What are the role of ethanol and acetic acid in chromosome study? 6+4
- (b) Mention the difference between qualitative and quantitative research. Briefly describe the APA style of referencing with suitable examples. 5+5
- (c) Discuss about the role of *Neurospora crassa* and *Arabidopsis thaliana* as model organisms in biological study. 5+5
- (d) Write an essay on common toxic chemicals used in biological laboratory for research and study with reference to the safety measures in their handling. 10

PAPER-8
INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY
GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- | | |
|---|---|
| (a) Define fermentation. | 1 |
| (b) What is TDS of water sample? | 1 |
| (c) What is In-situ bioremediation? | 1 |
| (d) Name one species of casein hydrolyzing microorganism. | 1 |
| (e) What do you understand by coliform bacteria? | 1 |
| (f) Name one medium for isolating root nodule bacteria. | 1 |
| (g) What do you understand by lyophilization in microbiology? | 1 |
| (h) Define Eutrophication. | 1 |

GROUP-B

2. Answer any *three* questions from the following: 5×3 = 15
- | | |
|---|---------|
| (a) Describe the components of a typical bioreactor. | 5 |
| (b) Give an outline of the downstream processing operations. | 5 |
| (c) Briefly describe the isolation process of microbes from the water sample. | 5 |
| (d) Discuss the applications of enzyme immobilization in an industry with special focus on glucose isomerase. | 5 |
| (e) What do you understand by ideal production media? What should be its important characteristics and composition? | 2+1½+1½ |

GROUP-C

3. Answer any *two* questions from the following: 10×2 = 20
- | | |
|---|-------|
| (a) Explain types of bioremediation strategies. Discuss its advantages and disadvantages. | 5+5 |
| (b) Define mycorrhizae. Describe briefly its different types. Give its significance. | 2+5+3 |
| (c) Narrate the role of microbes in domestic and sewage waste water treatment. | 5+5 |
| (d) Give a comparative account of Batch and continuous fermentation process. | 5+5 |

PAPER-9
BIOSTATISTICS

GROUP-A

1. Answer any *five* questions from the following: 1×5 = 5
- | | |
|---|---|
| (a) What does a small value of standard deviation indicate? | 1 |
| (b) Mention a demerit of Geometric mean. | 1 |
| (c) Define data. Give example. | 1 |
| (d) What do you mean by alternate hypothesis? | 1 |
| (e) What is scattered diagram? | 1 |

- (f) Define regression. 1
 (g) Define histogram. 1
 (h) Mention one each merit and demerit of range. 1

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) Write a short note on presentation data. 5
 (b) What is mean deviation? How does it differ from standard deviation explain with an example. 2+3
 (c) Define biostatistics and discuss about its significance and importance in biological research and study. 2+3
 (d) Write a brief note on different types of methods of data collection. 5
 (e) An observation of 35 *Geranium* plants shows the following data. Calculate the mode value. 5

No. of flowers / plants (x)	4	5	6	7	8	9	10
No. of plants (f)	3	6	6	9	5	4	2

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) Write an essay on testing of hypothesis with reference to student-t test, its application and advantages. 10
 (b) Briefly discuss about the correlation analysis. Differentiate between correlation and regression. 6+4
 (c) Calculate the arithmetic mean and standard deviation of the following data set. 10
- | | | | | | | | | |
|-------------------|-----|------|-------|-------|-------|-------|-------|-------|
| Class Interval | 0-5 | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 |
| Frequency (f) | 1 | 3 | 5 | 9 | 12 | 16 | 14 | 2 |
- (d) No. of fruits per inflorescence and their average mass / weight were studied in 10 randomly selected tomato plants and is represented in the following table. 10

No. of fruits per inflorescence	Average Mass/Weight of fruits (g)
10	12
12	11
14	10
16	09
17	9.5
15	10
11	10.5
12	11.2
16	9.2
13	11.3

Calculate the Pearson's Co-efficient of Correlation (r) and interpret it.

—x—