'समानो मन्त्रः समितिः समानी'

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

   (a) State the role of marker enzymes in cell fractionation.
   (b) What is the role of buffer in gel electrophoresis?
   (c) What is variance?
   (d) Which law is applicable in spectrophotometry?
   (e) What are TEM and SEM?
   (f) What is the full form of ELISA?
   (g) Mention the stationary and mobile phase of TLC.
   (h) Define centrifugation.

GROUP-B

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

   (a) Discuss the role of radioisotopes in biological research. 5

   (b) State the working principle of ion-exchange chromatography. Mention two applications and two limitations of the ion-exchange chromatography method. 1+2+2

   (c) Differentiate between: $2\frac{1}{2}\times2 = 5$
      (i) Mean and Mode
      (ii) Paper Chromatography and TLC.

   (d) Write short notes on: $2\frac{1}{2}\times2 = 5$
      (i) PAGE
      (ii) Fluorescence microscopy.

   (e) 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: $2\frac{1}{2}+2\frac{1}{2}$
   (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
   (a) What is the function of SOD?
   (b) Name two plant hormones involved in stress management.
   (c) What is MAPK enzyme?
   (d) Define glycophytes.
   (e) What are osmolytes? Give one example.
   (f) Give example of two PR proteins.
   (g) Define physiologically dry soil.
   (h) What is adaptation?

GROUP-B

2. Answer any ***three*** questions from the following: 5×3 = 15
   (a) Briefly describe the effects of cold stress on plants. 5
   (b) Elucidate the scavenging mechanism of ROS. 5
   (c) Write short notes on: $2\frac{1}{2}+2\frac{1}{2}$
      (i) Hypersensitive reactions
      (ii) Role of salicylic acid in biotic stress.
   (d) Enumerate the adaptive features of saline resistant plants. 5
   (e) How does SAR operate in plants? 5

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20
   (a) Describe the mediation of insect and disease resistance by jasmonates. 10
   (b) What is calcium modulation? Name the organelles where calcium is stored. Briefly describe the mechanism of calcium modulation. 2+1+7
   (c) Write short notes on: 5+5
      (i) Antioxidant enzyme system
      (ii) Phytoalexins.
   (d) 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
   (a) Define polyploidy.
   (b) What are molecular markers?
   (c) Give an example of inbreeding depression.
   (d) What is layering?
   (e) What is epistasis?
   (f) Name two chemical mutagens.
   (g) Name one plant product that has genes of bacterium.
   (h) Name two cross pollinated crops.

GROUP-B

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

(a) What is inbreeding depression? Mention its demerits. 5

(b) What are polygenes? Discuss briefly how polygenic inheritance affect genetic diversity in a population. 1+4

(c) Define vegetative propagation. State the advantage of vegetative propagation. 2+3

(d) Mention the role of biotechnology in crop improvement. 5

(e) Discuss in detail the interspecific hybridization technique.

GROUP-C

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

(a) Write short notes on:
   (i) Monogenic inheritance
   (ii) Cytoplasmic Male Sterility.

(b) What is hybridization? Briefly describe the role of hybridization in crop improvement. 2+8

(c) What is meant by plant genetic resources? Mention the important achievements and undesirable consequences of plant breeding. 2+8

(d) Write differences between: 5+5
   (i) Pedigree method and Bulk method
   (ii) Dominance hypothesis and over-dominance hypothesis.

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

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

(a) Give the full name of GIS.

(b) What is IPR?

(c) What is carbon footprint?

(d) What is β-diversity?

(e) Define Estuary.

(f) What is resource accounting?

(g) What do you mean by natural resource?

(h) What is meant by Ramsar site in India?

GROUP-B

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

(a) What is CBD? Discuss the role of CBD in addressing Wild Life issues. 1+4

(b) Write a short note on Bioprospecting. 5

(c) Differentiate between Renewable and Non-renewable energy. What are meant by major and minor forest products? 2+3

(d) Suggest a few useful ways of utilizing waste water. 5

(e) 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

(a) 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

(a) What is urban forestry?
(b) Name one weedicide.
(c) Name one ornamental flowering tree.
(d) What is surface irrigation?
(e) Write the full form of IPR.
(f) How does Ancient Indian garden differ from European garden?
(g) Write down the botanical name and family of Areca palm.
(h) Name two common post harvest disease of local fruits.

GROUP-B

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

(a) Discuss about different diseases and pests of ornamental plants. 5

(b) Write short notes on: $2\frac{1}{2}+2\frac{1}{2}$
(i) Border irrigation
(ii) Bonsai.

(c) Mention few advantages and disadvantages of food irradiation. $2\frac{1}{2}+2\frac{1}{2}$

(d) Define Eco-tourism. Write the role of Eco-tourism in urban horticulture. 1+4

(e) 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

(a) 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

(b) Write the scientific name and salient features of the following plants: $2\frac{1}{2}\times4=10$
(i) Carnations
(ii) Tuberose
(iii) Fishtail
(iv) Gulmohar.

(c) Discuss about different post-harvest technologies and their role to minimize losses during storage and transport. 10

(d) 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

(a) Define molal solution.
(b) What is Analytical Grade Reagent?
(c) Give one example of non-coagulant fixative.
(d) What is plagiarism?
(e) Write the full form of GFP.
(f) Give example of acidic dye.
(g) What is tissue maceration?
(h) What is a 'squash'?

GROUP-B

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

(a) Distinguish between quantitative and qualitative research. 5
(b) Write a note on common toxic chemicals used in the biological laboratory and safety measures in their handling. 5
(c) Give an account on squash preparation method. 5
(d) Mention the rationale behind dehydrating tissue section through graded solvent series. 5
(e) 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

(a) Write short notes on: 5+5
(i) Model Organisms in Biology
(ii) Library Research.
(b) 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
(c) Distinguish between: 5+5
(i) Coagulating fixative and non-coagulating fixative
(ii) Field research and laboratory research.
(d) 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

(a) What is a fluidized bed bioreactor?
(b) 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: $2\frac{1}{2}+2\frac{1}{2}$
(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 F_2-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 F_2 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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