'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2023

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
   (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: $2\frac{1}{2}+2\frac{1}{2}$
      (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

(a) What is biological database?

(b) What does BLOSUM stand for?

(c) What is DDBJ?

(d) Why bioinformatics is regarded as an inter-disciplinary subject?

(e) Cite one example of Protein database.

(f) Name one software used for molecular phylogenetic analysis.

(g) Define PAM.

(h) What is QSAR technique?

GROUP-B

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

(a) Write a note on the aim and scope of bioinformatics. 5

(b) What are the salient features of Swiss-Prot? Write down the sequential steps of data retrieval in PIR through flowchart. 2+3

(c) Define phylogeny. Draw a comparison between ML and NJ methods of phylogeny. 1+4

(d) Differentiate between PSI-BLAST, PHI-BLAST, and DELTA-BLAST. Elucidate the term ‘blastp’. 3+2

(e) Discuss the classification format of biological databases. 5

GROUP-C

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

(a) 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

(b) Write down the different branches of bioinformatics. Discuss the applications of bioinformatics on drug discovery and crop improvement. 2+4+4

(c) Give a detailed account on various sequence analysis tools of EMBL database. Write down the sequential steps of sequence submission to EMBL. 5+5

(d) 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
   (a) Give two examples of PR proteins.
   (b) Write the full form of 'SAR'.
   (c) Name any one example of "ROS".
   (d) What is resistance?
   (e) What are Sciophytes?
   (f) Name one cellular osmolytes.
   (g) What are antioxidants?
   (h) Name one calcium modulation protein in plant.

GROUP-B

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

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20
   (a) Give an account on "ROS" production and their scavenging mechanism. 10
   (b) Define temperature stress. State the symptoms of plant facing high temperature. How do plants encounter chilling stress? 2+4+4
   (c) Write short notes on: 5+5
      (i) Adaptive features of Xerophytes
      (ii) Calcium signaling.
   (d) 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
   (a) What do you mean by Primary introduction?
   (b) Name two vegetatively propagated crop plant.
   (c) Define germplasm.
   (d) Define the term acclimatization.
   (e) 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: 10×2 = 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: 1×5 = 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: 5×3 = 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: 10×2 = 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
(a) What do you mean by "model organism"?
(b) What is empirical research?
(c) What is gene flow?
(d) State one application of GFP.
(e) What is peel mounting?
(f) Name one toxic material used in laboratory.
(g) Define fluorochrome.
(h) Name one permanent mounting material.

GROUP-B

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

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20
(a) 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
(b) Name one physical and chemical fixative. Give a detailed account on the preparation of tissue for thin and ultrathin sections. 2+8
(c) Write short notes on: 5+5
(i) Model organisms in Biology
(ii) Safety measures in laboratory.
(d) 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
   (a) What is a crude media?
   (b) What is activated sludge?
   (c) Name one starch hydrolysing bacterium.
   (d) What is the use of baffles in a fermenter?
   (e) Name two soil inhabiting bacteria.
   (f) What is the purpose of spray drying?
   (g) What causes high BOD in water?
   (h) What is inoculum?

GROUP-B

2. Answer any ***three*** questions from the following: 5×3 = 15
   (a) Differentiate between batch and continuous culture. What do you understand by ideal production media? 3+2
   (b) Describe the method of industrial production of glutamic acid. 5
   (c) Briefly describe the isolation process of microbes from soil sample. 5
   (d) Discuss in brief the alternative methods available for the mass culture of microorganisms in industrial process. 5
   (e) Write notes on: $2\frac{1}{2}+2\frac{1}{2}$
      (i) Glucose isomerase
      (ii) TDS.

GROUP-C

3. Answer any ***two*** questions from the following: 10×2 = 20
   (a) What is biological N_2-fixation? Discuss the components and role of nitrogenase complex enzyme. Discuss the symbiotic relationship between *Rhizobium* and Leguminous plants. 2+2+2+4
   (b) 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
   (c) Distinguish between solid state and liquid state fermentation. What is bioreactor? Describe the structure and working principle of airlift fermenter. 4+2+4
   (d) 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
   (a) What is frequency distribution?
   (b) 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

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