'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2021

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 and 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 is meant by magnification power of microscope?
   (b) What is the full form of FISH?
   (c) State the difference between AGE and PAGE.
   (d) What are radioisotopes? Give one example.
   (e) What is meant by goodness of fit?
   (f) What is cryofixation?
   (g) What is the full form of HPLC?
   (h) State the difference between shadow casting and freeze etching.

GROUP-B

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

   (a) State the differences between transmission and scanning electron microscopy. 5
   (b) Define centrifugation. Discuss in brief the working principle of ultracentrifugation. 1+4
   (c) Distinguish between: $2\frac{1}{2}+2\frac{1}{2}$
      (i) Population and Sample
      (ii) Mean And Mode
   (d) Write short notes on: $2\frac{1}{2}+2\frac{1}{2}$
      (i) Marker enzymes
      (ii) Chromosome banding
   (e) Discuss the working principle of Mass spectrometry with a neat diagram. 5

GROUP-C

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

(a) What is electrophoresis? Discuss the process for separation of proteins with proper diagram. 2+8

(b) Write an account on X-ray crystallography. State the Bragg's law. 8+2

(c) What is chromatography? State the differences between TLC and GLC. 2+8

(d) Write short notes on: $2\frac{1}{2}$ ×4=10

(i) Negative staining

(ii) Chromosome painting

(iii) Measures of dispersion

(iv) Radioisotopes in biological research

PAPER-2

BIOINFORMATICS

GROUP-A

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

(a) Name a tool of DDBJ which can be used for finding out taxonomic classification of an organism.

(b) Give full form of INSDC.

(c) Is NCBI a free-to-access or paid database?

(d) What is the utility of PASC?

(e) What is a PAM unit?

(f) What is QSAR?

(g) Define Pairwise Sequence Alignment.

(h) What is protein identification resource?

GROUP-B

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

(a) State the salient features of BLOSUM. 5

(b) Distinguish between primary and secondary databases. $2\frac{1}{2}+2\frac{1}{2}$

(c) Write short notes on features of PIR. 5

(d) State the significance of e-value in BLAST. 5

(e) What is GenBank? Describe the process of sequence submission in NCBI. 2+3

GROUP-C

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

(a) Write a short note on the types of sequence alignment. Give a detailed description of the different types of scoring matrices. 4+6

(b) Write notes on: 5+5

(i) Swiss-Prot

(ii) DDBJ.

(c) Give an account of the applications of bioinformatics in microbial research and crop improvement. 5+5

(d) Name three methods to draw a phylogenetic tree. Explain how neighbour joining method of phylogenetic tree construction work. 3+7

PAPER-3

STRESS BIOLOGY

GROUP-A

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

(a) What is meant by ROS?

(b) Differentiate between paraheliotropic and diaheliotropic leaves.

(c) Write the full form of PR protein.

(d) Distinguish between acclimation and adaptation.

(e) Write the function of catalase.

(f) What is hypersensitive reaction (HR)?

(g) Write the full form of SAR.

(h) Define phytoalexin.

GROUP-B

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

(a) Write short notes on compatible solute production. 5

(b) Briefly discuss the mechanism of phospholipid signaling. 5

(c) How does compatible osmolyte adjust osmotic pressure of the cell under water stress condition? 5

(d) Mention two important adaptations of temperature tolerant and drought tolerant plants. $2\frac{1}{2}+2\frac{1}{2}$

(e) Briefly discuss about the role of calcium in stress signaling. 5

GROUP-C

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

(a) Describe in brief IP3-DAG pathway. 10

(b) Discuss the role of jasmonate in resistance to diseases. 10

(c) Briefly discuss the various factors that lead to abiotic stress and impact on the plant health status. 10

(d) Discuss the role of antioxidative enzymes in ROS scavenging. 10

PAPER-4

PLANT BREEDING

GROUP-A

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

(a) What is layering?

(b) What is polygenic inheritance?

(c) Who first established pure-line theory?
(d) Define germplasm.
(e) What is a clone?
(f) What is meant by male sterility in plants?
(g) Define transgressive segregation.
(h) What is meant by acclimatization?

GROUP-B

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

(a) Explain the concept of quantitative inheritance with respect to skin colour of human being. 5

(b) Define heterosis. Explain dominance hypothesis of heterosis. 1+4

(c) Discuss the prime objectives of plant breeding. 5

(d) Briefly describe the process of grafting. 5

(e) Differentiate between Dominance hypothesis and over dominance hypothesis. 5

GROUP-C

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

(a) Distinguish between pollen bank and seed bank. State their applications in crop improvement. 5+5

(b) Define vegetative propagation. State the advantages of vegetative propagation over seed based propagation. Discuss the different types of cutting. 2+2+6

(c) Define inter-specific hybridization. Briefly discuss the inter-specific hybridization technique. Mention the achievements of inter-specific hybridization technique. 2+6+2

(d) Discuss the impact of polyploidy in crop improvement and breeding. Describe the genetic basis of inbreeding depression. 5+5

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

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

(a) Give the full form of GIS.
(b) What is Ramsar site?
(c) What do you mean by carbon footprint?
(d) Define fossil fuel.
(e) What is bio-prospecting?
(f) List two traditional system of water harvesting.
(g) What is in-situ conservation?
(h) What is biodiversity?

GROUP-B

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

(a) What are non-renewable resources of energy? List the characteristics of a good fuel. 3+2

(b) Name any four categories of people who depend on the forest resources, mentioning major needs of each category. 5

(c) Write short notes on: $2\frac{1}{2}\times2=5$

(i) Bioprospecting

(ii) Biodiversity action plan.

(d) Explain in brief various steps and processes of EIA. 5

(e) State the importance of ex-situ conservation. 5

GROUP-C

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

(a) Explain National Biodiversity Action Plan. Discuss the role of CBD. 5+5

(b) What are the ecological services provided by forests? Explain with examples. 10

(c) Describe the different measures and importance of wildlife conservation. 10

(d) Write short notes on: $2\frac{1}{2}\times4=10$

(i) Ecotourism

(ii) Threats to biodiversity

(iii) IPR

(iv) Non-conventional sources of energy.

PAPER-6

HORTICULTURE

GROUP-A

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

(a) Mention the different branches of horticulture.

(b) What is desuckering?

(c) Write one difference between formal and informal style of garden.

(d) What is avenue planting?

(e) Name two ornamental flowering plants.

(f) What is black tip of mango?

(g) Write botanical names of two vegetable crops.

(h) Give one advantage of meristem culture.

GROUP-B

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

(a) Write a short note about Japanese garden.

(b) Discuss the different IPR issues in the context of horticulture.

(c) Write about the various pests and diseases of citrus crop.

(d) Briefly describe the changes in plant growth factor at the time of fruit ripening.

(e) Discuss the harvesting and handling of fruits in horticultural practices.

GROUP-C

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

(a) Describe the different asexual propagation methods of fruit crops. 10

(b) Define PGR. Mention different types of PGR used in horticulture along with their functions. 1+9

(c) What is landscaping? Write about the principles of landscaping. 2+8

(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 normal solution.

(b) Name one positively charged dye.

(c) Why is fixation required in plant tissue study?

(d) What do you mean by proteomics?

(e) What is maceration?

(f) What is GFP tag?

(g) What is a peel mount preparation?

(h) Give an example of non-coagulant fixative.

GROUP-B

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

(a) Give an account on descriptive and analytical research methodology. 5

(b) Describe the process of preparation of 5(M) solution of KNO_3. 5

(c) Give a detailed account on the preparation of tissue for microtome sectioning. 5

(d) Write the advantages and disadvantages of field research. 5

(e) Describe the process of squashed plant preparation for mitotic stages observation. 5

GROUP-C

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

(a) What is a permanent slide? Why is dehydration of tissue important for it? Give a detailed account on the process of dehydration of a t.s. of an angiospermic stem. 1+2+7

(b) Write notes on: 5+5

(i) Chemical fixative

(ii) Fluorescent dye.

(c) What is a stain? Classify stains based on their chemical nature. Describe the process of gram staining. 1+3+6

(d) What is a model organism? Why are they important in research? State the limitations of model organism. 1+6+3

PAPER-8

INDUSTRIAL MICROBIOLOGY

GROUP-A

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

(a) Name one species of fungus responsible for citric acid production.

(b) What is a fluidized bed bioreactor?

(c) What is semisynthetic penicillin?

(d) Name one species of casein hydrolyzing microorganism.

(e) What is glucose isomerase?

(f) What do you understand by coliform bacteria?

(g) Define bioremediation.

(h) What is bacteroid?

GROUP-B

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

(a) Write a short note on solid-state fermentation. 5

(b) Describe the various components of a typical fermentor. 5

(c) What are the advantages of enzyme immobilization? 5

(d) Write notes on: $2\frac{1}{2}\times2=5$

(i) BOD

(ii) COD.

(e) What is biological nitrogen fixation? Discuss the components and role of nitrogenase complex enzyme. 1+4

GROUP-C

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

(a) Critically differentiate between batch and continuous fermentation. 5+5

(b) What do you understand by downstream processing? Give an outline with explanation. 2+8

(c) Discuss in detail the industrial production of commodity alcohol. 10

(d) Discuss the different types of mycorrhizal association. 10

PAPER-9

BIOSTATISTICS

GROUP-A

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

(a) What is standard error?

(b) Write the symbols to designate population and sample respectively.

(c) What is degree of freedom?

(d) What is hypothesis testing?
(e) What is regression line?
(f) What is Null Hypothesis?
(g) Write the equation which describes the linear relationship between two variables.
(h) What is sampling error?

GROUP-B

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

(a) What are data? Differentiate between primary and secondary data. 2+3

(b) Briefly discuss the various methods of sampling in statistical study. 5

(c) What is the difference between classification and tabulation of data? Write the objectives of classification of data. 2+3

(d) Why (n–1) is used to calculate the standard deviation when sample size is small? What is C.V? Write down the formula for calculating variance. 2+1+2

(e) Differentiate between correlation and regression. 5

GROUP-C

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

(a) Discuss the uses and limitations of biostatistics. 5+5

(b) What do you mean by test of goodness of fit? In a hybridisation experiment, one observed 315 round and yellow; 108 round and green; 101 wrinkled and yellow and 32 wrinkled and green pea seeds. According to the law of heredity, the numbers should be in the proportion of 9:3:3:1. Is there any evidence to doubt this law at 0.05 level of significance (at 3.d.f. $\chi^2_\alpha = 7.82$). 2+8

(c) 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. Write down your comment on comparison. 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

(d) The effect of pesticide, vuvan, is tested on germination of *Brassica* seeds. Find out the correlation coefficient (r). 10

Conc. of Pesticide (PPm)	0	1	2.5	5	7.5	10	12.5	15	20
% of Germination	90	81	65	52	39	32	28	17	6

——×——