'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2022

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) What are the full form of FISH and FACS?
   (b) What do you mean by chromosome painting?
   (c) What is ultra-centrifugation?
   (d) Mention two important features of an ideal stationary phase in column chromatography.
   (e) What are the applications of X-ray diffraction spectrometry?
   (f) What is the role of PAGE in characterization of biomolecules?
   (g) Mention two methods of measuring central tendency.
   (h) What are the differences between Mean deviation and Standard deviation?

GROUP-B

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

   (a) Write a short note on freeze-fracture. 5
   (b) Define data. Discuss about different methods of data representation. 1+4
   (c) Give an account of sample preparation for electron microscopy. 5
   (d) Discuss about the principle and application of column chromatography. 2+3
   (e) Give an account of centrifugation with special reference to density gradient centrifugation. 5

GROUP-C

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

   (a) Write an essay on fluorescence microscopy along with its merits and demerits. 8+2
   (b) How the concentration of unknown sample is determined using spectrophotometry? 10
   (c) Write an essay on Chi-square test for goodness of fit. 10

(d) Write short notes on: 5+5
   (i) Auto-radiography
   (ii) Pulse-chase experiment.

PAPER-2

BIOINFORMATICS

GROUP-A

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

(a) What is FASTA?

(b) State the expanded form of KEGG.

(c) Name one pairwise sequence alignment tool.

(d) What is PSA?

(e) Draw a rooted polyphyletic tree.

(f) Name a tool of NCBI which can be used to find out taxonomic classification of an organism.

(g) What is tblastx?

(h) What is Swiss-Prot?

GROUP-B

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

(a) Distinguish between sequence databases and structure databases. 5

(b) Write a note on application of bioinformatics in crop improvement. 5

(c) What is the importance of multiple sequence alignment in bioinformatics? 5

(d) Write a short note on the architecture of BLAST. 5

(e) What are the major resources of DDBJ? 5

GROUP-C

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

(a) Give a detailed account of structural bioinformatics in drug discovery. 10

(b) Write notes on : 5+5
   (i) EMBL database
   (ii) Different softwares used for phylogenetic analysis.

(c) Distinguish between PAM and BLOSUM. State the data submission mechanism to NCBI. What is the use of CLUSTALW? 4+4+2

(d) Write notes on: 5+5
   (i) Consistency of molecular phylogenetic prediction
   (ii) Scope and research areas in bioinformatics.

PAPER-3

STRESS BIOLOGY

GROUP-A

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

(a) What are pneumatophores?

(b) Define 'physiologically dry soil'.

(c) Which hormone is called as 'stress hormone'?

(d) Name two non-enzymatic antioxidants.

(e) What is Hypersensitive Reaction?

(f) What is PR-9 protein?

(g) Name one salinity tolerant plant.

(h) Define osmolyte.

GROUP-B

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

(a) How is ROS produced in plants?

(b) Distinguish between: $2\frac{1}{2}+2\frac{1}{2}$

(i) Acclimation and adaptation

(ii) Highlight stress and temperature stress.

(c) How does SAR operate in plants? 5

(d) Briefly describe the physiological defense mechanism in plants. 5

(e) How does water logging affect plants? 5

GROUP-C

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

(a) Discuss the adaptations of plants to different light conditions. 10

(b) What is calcium modulation? Name the organelles where calcium is stored. Briefly discuss the mechanism of calcium modulation. 2+1+7

(c) Write short notes on: 5+5

(i) Physical defense mechanism

(ii) Aerenchyma development.

(d) Describe the mediation of insect and disease resistance by jasmonates. 10

PAPER-4

PLANT BREEDING

GROUP-A

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

(a) What is Allopolyploidy?

(b) Name two self-pollinated crops.

(c) Define germplasm.

(d) What is layering?
(e) What is inbreeding depression?
(f) Define restorer line in male sterility.
(g) Define polygenic inheritance.
(h) Name two chemicals used in male-sterility method.

GROUP-B

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

(a) Discuss the genetic basis of heterosis. 5
(b) Differentiate between mass selection and pure-line selection. 5
(c) Write short note on effects of domestication. 5
(d) Discuss the primary objectives of plant breeding. 5
(e) Describe briefly the interspecific hybridization technique. 5

GROUP-C

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

(a) What are plant genetic resources? Give an account on different types of plant genetic resources. 2+8
(b) Describe the various selection methods of plant breeding. 10
(c) Briefly explain the various methods of hybridization in self-pollinated and cross-pollinated crops. 5+5
(d) Define quantitative inheritance. Briefly explain quantitative inheritance of Kernel colour in Wheat. 2+8

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

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

(a) What is aquifer?
(b) Name two nuclear power producing centres in India.
(c) What is carbon footprint?
(d) Write full name of CBD.
(e) Define sustainable utilization.
(f) What is beta diversity?
(g) What is biodiesel?
(h) Define nuclear fusion.

GROUP-B

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

(a) Discuss the various soil restoration procedures. 5
(b) What is biodiversity? Discuss various types of biodiversity. 1+4
(c) Give an account of major and minor forest products. 5

(d) Write a note on rain water harvesting. 5

(e) Write notes on: (i) PRA (ii) GIS. $2\frac{1}{2}+2\frac{1}{2}$

GROUP-C

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

(a) Discuss the role of wetland in conservation of environment. How can the wetlands be conserved? 6+4

(b) Write notes on: 5+5

(i) Bioprospecting

(ii) Ecological diversity.

(c) Discuss various renewable resources of energy. What are the advantages and disadvantages of using these sources of energy? 6+2+2

(d) Give an account of various sources of waste and its effects on the environment. 5+5

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

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

(a) Mention the name of the most common disease seen in nursery and its pathogen.

(b) Mention two salient features of Mughal garden.

(c) What is Lawn?

(d) Whiptail in cauliflower is caused by deficiency of which nutrient?

(e) Distinguish between grafting and layering.

(f) Give two examples of antitranspirants.

(g) Name two cultivated varieties of Mango.

(h) Define biofertilizer with a suitable example.

GROUP-B

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

(a) Explain the role of biopesticides in the control of various diseases in horticulture. 5

(b) Mention the salient features of Japanese style of landscape gardens. 5

(c) Write a short note on quarantine practices. 5

(d) What is the most important PGR that is responsible for fruit ripening? How it helps in fruit ripening? 1+4

(e) What is micropropagation? Write the advantages of micropropagation over conventional asexual propagation. 2+3

GROUP-C

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

(a) Mention about different IPM strategies for plant protection. 10

(b) Discuss in brief the different types of asexual propagation methods usually observed in horticultural practices. 10

(c) Discuss the different techniques of making bonsai. 10

(d) Mention the different methods of minimizing losses during storage and transportation of planting materials of horticultural importances. 10

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

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

(a) Define research.

(b) Name two common toxic chemicals.

(c) Define Molality.

(d) What do you mean by proteomics?

(e) State one application of scale bars.

(f) Define maceration.

(g) What do you mean by plagiarism?

(h) Name two reactive dyes.

GROUP-B

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

(a) Write a short note on literature review. 5

(b) State the importance of label in reagent bottles. How to prepare a 1 M solution of NaCl? [Atomic mass: Na = 23; Cl = 35.5] 3+2

(c) Discuss the principles of maintaining laboratory records. 5

(d) Portray the key biological research areas with special reference to biochemistry and molecular biology. 5

(e) Briefly elucidate the cytogenetic techniques with squashed plant materials. 5

GROUP-C

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

(a) Discuss the varied types of research in detail. 10

(b) Write notes on: 5+5

(i) Techniques of handling micropipettes

(ii) Art of field photography.

(c) Explain the methodologies to study plant cell / tissue culture with special reference to mounting techniques, tissue preparation, sectioning and paraffin infiltration. 10

(d) Write notes on: 5+5

(i) Abbreviations and nomenclature used in scientific writing

(ii) Reference Writing.

PAPER-8

INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

GROUP-A

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

(a) What is pure culture?
(b) Name two microorganisms producing glucose isomerase.
(c) What is pilot scale bioreactor?
(d) What is solid state fermentation?
(e) What is immobilized enzyme?
(f) Why BOD reduction is necessary in waste water treatment?
(g) Name one microorganism involved in starch hydrolysis.
(h) What is bacteroid?

GROUP-B

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

(a) What is leghaemoglobin? How does it help in nitrogen fixation? 1+4
(b) Differentiate between stationary and submerged fermentation technique. 5
(c) Describe the isolation of microorganisms from contaminated water samples. 5
(d) Briefly discuss the scope of microbes in industry. 5
(e) Write short notes on: $2\frac{1}{2}\times2=5$
   (i) Spray drying
   (ii) TOC.

GROUP-C

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

(a) Discuss in detail the structure of a typical bioreactor. What are the issues taken care of while designing an efficient bioreactor? 6+4
(b) What is bioremediation? What are the different mechanisms for bioremediation of soil? 2+8
(c) Discuss in detail the commercial production of penicillin. Name one semisynthetic penicillin. 9+1
(d) Discuss in detail the steps in the treatment of sewage and the organisms involved. 10

PAPER-9

BIOSTATISTICS

GROUP-A

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

(a) State the range of Pearson's Correlation Co-efficient (r).
(b) What is meant by Random Sampling?
(c) Differentiate between Primary data and Secondary data.
(d) Calculate the harmonic mean of the following series: $x = 2, 4, 6, 8$
(e) Find out the value of median, if mean = 16 and mode = 21.
(f) Differentiate between null hypothesis and alternative hypothesis.

(g) Which sampling method is mostly followed in biostatistics?

(h) Give the full form of ANOVA.

GROUP-B

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

(a) What is Standard Deviation (SD)? Why measurement of SD is more applicable in Biostatistics? What are its merits and demerits? 1+1+3

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

(i) Co-efficient of variation

(ii) Standard error.

(c) Distinguish between: $2\frac{1}{2}\times2=5$

(i) Correlation and Regression

(ii) Mean, Median and Mode.

(d) 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 = 25

Green and wrinkled seeds = 10

(e) What do you mean by sample and sampling? Give some good methods of sampling. 2+3

GROUP-C

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

(a) The following data is observed in case of leguminous plants: 8+2

Number of seeds/pod	1	1	2	5	4	6	3	2	3	4
Length of pod (cm)	2	1.5	2	4.5	5	7	4	3	3	4.5

Calculate the Pearson's Correlation-coefficient (r) and interpret.

(b) What do you mean by χ^2-test of goodness of fit? Mention the formula of calculating the χ^2-value. 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 1 df , $\chi^2_{\alpha=0.05} = 3.84$). 2+1+7

(c) Classify the following data of No. of seeds / fruit. Calculate the standard deviation. 4+6

12 14 13 6 7 21 17 15 13 12 7

8 11 20 11 19 18 9 10 13 13 15

12 14 13 11 9 8 16 14 18 9 10

16 15 16 10 10 13 11 14 12 14 13

11 13 14 15 12 17

(d) Compute the arithmetic mean, median and mode from the following data: 4+3+3

Plant height (cm)	0-10	10-20	20-30	30-40	40-50	50-60
No. of varieties	5	10	25	30	20	10

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