'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 6th Semester Examination, 2022

DSE-P4-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 DSE3. The 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 do you understand by resolving power of a microscope?
   (b) Name two radioisotopes used in biological research.
   (c) State the difference between absorbance and transmission.
   (d) Give the full form of PAGE.
   (e) What is meant by goodness of fit?
   (f) What is meant by magnification of a microscope?
   (g) What do you understand by mean deviation?
   (h) Distinguish between population and sample.

GROUP-B

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

   (a) Give a comparative account between transmission and scanning electron microscopy. 5
   (b) What is autoradiography? Briefly discuss pulse-chase experiment. 1+4
   (c) Write short notes on: $2\frac{1}{2}\times2$
      (i) Chromosome banding
      (ii) Measures of dispersion.
   (d) How can you determine the concentration of unknown sample using spectrophotometry? 5
   (e) Distinguish between: $2\frac{1}{2}\times2$
      (i) Mean and Mode
      (ii) Affinity chromatography and GLC.

GROUP-C

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

(a) Discuss in detail the working principle of agarose gel electrophoresis. How does the working principle of SDS-PAGE differ from that of AGE? 6+4

(b) What are the different types of chromatography? Discuss in detail ion-exchange chromatography with a proper diagram. 2+8

(c) Distinguish between: 5+5

(i) TLC and HPLC

(ii) Light microscopy and Fluorescence microscopy.

(d) Discuss in detail the methods used for sample preparation in electron microscopy. Why sampling is essential in biostatistics? 6+4

PAPER-2

BIOINFORMATICS

GROUP-A

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

(a) Why bioinformatics is considered as an interdisciplinary subject?

(b) What is PIR? When was it established?

(c) Define Multiple Sequence Alignment.

(d) What is IC_{50}?

(e) What is T-COFFEE?

(f) Give full form of FASTA.

(g) What is Blink?

(h) Differentiate between homology and analogy.

GROUP-B

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

(a) Write a short note on derivative database of NCBI. 5

(b) What is Swiss-Prot? What are the salient features of it? 1+4

(c) What is biological database? How do you classify biological database based on data type? 1+4

(d) Define phylogeny. Draw a comparison between neighbor-joining and maximum likelihood method of phylogeny. 1+4

(e) Write notes on: $2\frac{1}{2}+2\frac{1}{2}$

(i) Scope of bioinformatics

(ii) Research areas of bioinformatics.

GROUP-C

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

(a) What are the different available tools for sequence analysis in EMBL? Give a schematic diagram of steps involved in sequence submission on EMBL database. 4+6

(b) Write short notes on: 5+5

(i) LIBRA

(ii) SAKURA.

(c) State the salient features of BLOSUM. Write a note on different types of standard scoring matrices. Expand PAM. 4+5+1

(d) What is QSAR? How does it help to predict activity for new compounds? What are rooted and unrooted phylogenetic trees? 2+6+2

PAPER-3

STRESS BIOLOGY

GROUP-A

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

(a) What are HSPs? Give one example.

(b) Define permanent wilting point.

(c) What is PR-9?

(d) Define acclimation.

(e) What is supercooling?

(f) Give two examples of ROS.

(g) What is resistance?

(h) Define tolerance.

GROUP-B

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

(a) Briefly describe the effects of temperature stress on plants. 5

(b) Mention the various agronomical methods of low temperature stress mitigation. 5

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

(i) Changes in root : shoot ratio

(ii) Compatible solutes.

(d) Enumerate the various roles of jasmonates in plants. 5

(e) Mention the adaptations of salinity resistant plants. 5

GROUP-C

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

(a) What is HR? Describe with diagrams how this phenomenon occurs during pathogen attack. 2+8

(b) What are compatible osmolytes? Discuss the calcium modulation in plants during stress. 2+8

(c) Discuss the phospholipid signaling mechanisms in stress sensing mechanisms in plants. 10

(d) Discuss the physical and physiological defense mechanisms in plants. 5+5

PAPER-4

PLANT BREEDING

GROUP-A

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

(a) Name one green manure.

(b) What is pure lines?

(c) What is parthenocarpy?

(d) Name one plant product that has genes of a bacterium.

(e) What is layering?

(f) What is meant by transgressive segregation?

(g) Expand QTL.

(h) What are molecular markers?

GROUP-B

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

(a) Define heterosis. How is the phenomenon utilized in plant breeding? 1+4

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

(c) Write a short note on genetic basis of inbreeding depression. 5

(d) Illustrate various advantages and limitations of hybridization in crop improvement. $2\frac{1}{2}+2\frac{1}{2}$

(e) Discuss in detail the interspecific hybridization technique. 5

GROUP-C

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

(a) What is quantitative inheritance? Explain the mechanism of inheritance of kernel color in wheat. 2+8

(b) Write short notes on: 5+5

(i) Monogenic inheritance

(ii) Objectives of plant breeding.

(c) Elucidate the procedure, advantages and limitations of self pollinated plants. $5+2\frac{1}{2}+2\frac{1}{2}$

(d) What is meant by plant genetic resources? Discuss in brief different types of plant genetic resources. 2+8

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

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

(a) Define 'biodiversity'.

(b) What is biodiesel?

(c) Give the full name of EIA.

(d) What is carbon footprint?

(e) What is geothermal energy?

(f) Define 'sustainable utilization'.

(g) What is forest cover?

(h) What is CBD?

GROUP-B

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

(a) What is IPR? How IPR is implemented to protect biodiversity? 1+4

(b) Write a note on 'Ecological footprint'. 5

(c) Discuss the advantages and disadvantages of uses of nuclear energy. 5

(d) Discuss the ecological and sociocultural approaches of sustainable utilization. 5

(e) What are the advantages and disadvantages of using solar energy? 5

GROUP-C

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

(a) Discuss in detail various waste management processes. What are the impact of waste materials on environment? 6+4

(b) What are the different techniques of forest management? How the socio-economic activity results in forest depletion? 5+5

(c) Write notes on: 5+5

(i) Biodiversity conservation strategies

(ii) Tidal energy.

(d) What are the reasons of soil degradation? Write a note on soil restoration methods. 5+5

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

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

(a) Name two edible cucurbits.

(b) Define horticulture.

(c) What are climbers?
(d) Define hydroponics.
(e) What do you mean by the term 'cut flower'?
(f) Briefly explain the term— Quality trait.
(g) Expand IPM.
(h) What is the importance of conservation of germplasm?

GROUP-B

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

(a) Briefly describe the terms: $2\frac{1}{2}\times2$
   (i) Urban horticulture
   (ii) Ecotourism.
(b) Write a short note on the different fruit varieties found in North Bengal, with special emphasis on varieties of citrus. 3+2
(c) What are ornamental plants? Differentiate between annuals and perennials and also define these two terms. 1+2+(1+1)
(d) Write a short note on the policies and practices of urban forestry. 5
(e) Write a short note on the importance of flower shower and exhibitions. 5

GROUP-C

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

(a) Write a short note on identification of deficiency symptoms. Give an account of the various field diseases and post-harvest diseases. 4+6
(b) Elucidate the different types of gardening traditions. $2\frac{1}{2}\times4$
(c) Write short notes on: 5×2
   (i) Irrigation methods
   (ii) Asexual methods of propagation.
(d) Briefly describe the salient features of some ornamental flowering plants. 10

PAPER-7
RESEARCH METHODOLOGY

GROUP-A

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

(a) Define Normality.
(b) What do you mean by 'Model organism'?
(c) What is maceration?
(d) What is gene flow?
(e) Define fluorochrome.
(f) What is copyright?

(g) Mention one importance of graph.

(h) How electron microscopy help in imaging?

GROUP-B

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

(a) How do you prepare one molar and one Normal solution of NaCl? $2\frac{1}{2}+2\frac{1}{2}$

(b) Distinguish between quantitative and qualitative research. 5

(c) Write short notes on genomics. 5

(d) Give an account on scientific writing and its ethics. 3+2

(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) Name one physical and one chemical fixative. Give a detailed account on the preparation of tissue for microtome sectioning. 2+8

(b) Write short notes on:

(i) Safety measures in laboratory

(ii) Maintaining a laboratory record.

(c) What is permanent slide? Distinguish between dye and stain. Describe the process of gram staining. 1+3+6

(d) What is fundamental research? Write a short note on literature and review and its consolidation. What are the various importance of model organism in research? 1+5+4

PAPER-8
INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

GROUP-A

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

(a) Name one symbiotic nitrogen fixing microorganism.

(b) Define BOD.

(c) Why microbes are important in making different industrial products?

(d) Define eutrophication.

(e) What do you understand by coliform bacteria?

(f) Define fermentation.

(g) What do you understand by bioremediation?

(h) What is the safe TDS of drinking water?

GROUP-B

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

(a) What is an indicator organism? Briefly discuss the properties of indicator organism. 1+4

(b) Define TOC and BOD. State the similarities and differences between these two. 1+4

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

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

(e) Discuss in brief the alternative methods available for the mass culture of microorganisms in industrial process. 5

GROUP-C

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

(a) Differentiate between batch and continuous culture. Discuss in detail the construction of an aerobic fermenter with proper diagram. 2+8

(b) What do you understand by faecal coliforms? Discuss in detail the multiple tube fermentation technique used in sanitary analysis of water. 2+8

(c) What is bulking sludge? Name several important microbial groups that contribute to this problem. Discuss in detail the aerobic secondary sewage treatment procedures with proper diagram. 1+1+8

(d) Write short notes on: 5+5

(i) Downstream processing

(ii) Mycorrhizae.

PAPER-9

BIOSTATISTICS

GROUP-A

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

(a) What is meant by secondary data?

(b) What is class interval?

(c) If the value of coefficient of correlation (r) is -0.9, what would be the type of correlation?

(d) Define range.

(e) What is geometric mean?

(f) Mention two characteristics of central tendency.

(g) What is simple regression? Also, mention its equation.

(h) Why "Student's 't' test" is named so?

GROUP-B

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

(a) Differentiate between qualitative and quantitative data. What are the methods employed for the collection of primary data? 3+2

(b) Calculate the arithmetic mean of marks in Statistic of 10 students given in the following table: 3+2

Roll No.	1	2	3	4	5	6	7	8	9	10
Marks	67	69	66	68	72	63	76	65	70	74

Mention two demerits of Arithmetic Mean.

(c) What is sampling? How does attributes differ from variables? What are the advantages of tabulation? 2+1+2

(d) Differentiate between Arithmetic Mean and Mode. Find the median of the following numbers— 2+3

88, 72, 33, 29, 70, 86, 54, 91, 61, 57

(e) What is Mean Deviation? How is it different from Standard deviation? Calculate the mean deviation from the following: 1+1+3

X	10	11	12	13	14
F	3	12	18	12	3

GROUP-C

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

(a) Applications of fertilizers were tested for the yield of rice grown in 10 plots. Another set of 10 plots of similar size and condition were taken as control. Test the effect of fertilizer. 10

Plot No.	1	2	3	4	5	6	7	8	9	10
Fertilizer applied	16	14	18	15	13	17	16	15	14	13
Fertilizer not applied	10	12	11	9	13	13	12	14	13	11

(b) The rainfall and the output of wheat per acre for a farm was as follows: 8+2

Rainfall (cm)	40	20	32	35	40	45	43	30	25	50
Wheat production (quintals)	120	120	145	150	100	120	120	135	130	140

Find the correlation coefficient between rainfall and wheat production. Mention the properties of co-efficient of correlation.

(c) Calculate the mean, the median and the mode of the frequency distribution. 3+4+3

Class limits	130-134	135-139	140-144	145-149	150-154	155-159	160-164
Freq.	5	15	28	24	17	10	1

(d) The following table shows that ages (X) and blood pressure (Y) of 8 persons— 10

Age (X)	52	63	45	36	72	65	47	25
B.P (Y)	62	53	51	25	79	43	60	33

Obtain the regression equation of (Y) on (X). Also find the expected B.P of a person who is 49 years old.

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