



'समानो मन्त्रः समितिः समानी'

**UNIVERSITY OF NORTH BENGAL**  
B.Sc. Honours 5th Semester Examination, 2021

**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 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:  $1 \times 5 = 5$
- (a) What do you mean by resolving power of a microscope?
  - (b) Give full form of AGE and SDS-PAGE.
  - (c) Name two marker enzymes used in cell fractionation.
  - (d) Define radioisotope.
  - (e) Mention the stationary and mobile phase of TLC.
  - (f) Differentiate between absorbance and transmission.
  - (g) What do you mean by protein purification?
  - (h) Find out the missing figure: Mean – Mode = ? (Mean – Median)

**GROUP-B**

2. Answer any *three* questions from the following:  $5 \times 3 = 15$
- (a) Briefly describe different types of chromosome banding techniques.
  - (b) How can you determine the concentration of unknown sample using spectrophotometry?
  - (c) Briefly describe the method applied for pigment separation.
  - (d) Write notes on Fluorescence microscopy and Confocal microscopy.
  - (e) Differentiate between:
    - (i) SEM and TEM
    - (ii) Paper chromatography and TLC.

**GROUP-C**

3. Answer any *two* questions from the following:  $10 \times 2 = 20$
- (a) Describe the method of sample preparation in electron microscopy. What is shadow casting?

- (b) Mention the principle of centrifugation. How density is used to separate DNA?
- (c) How will you separate different polypeptides of a protein? Explain your answer with proper diagram.
- (d) What is sampling? Why sampling is essential in biostatistics? Suppose in garden pea, yellow cotyledon colour is dominant to green and inflated pod shape is dominant to constricted form. Considering both these traits jointly in self-fertilized dihybrids, the progeny appeared in the following numbers:  
Yellow, inflated =317; Yellow, constricted =109; Green, inflated =102 and Green, constricted = 32. Do these genes assort independently? Support your answer using Chi-square analysis.

**PAPER-2**  
**BIOINFORMATICS**  
**GROUP-A**

- |    |  |                  |
|----|--|------------------|
| 1. | Answer any <i>five</i> questions from the following:   | $1 \times 5 = 5$ |
|    | (a) What is a database?<br>(b) What is BLASTx?<br>(c) What do you understand by pairwise alignment?<br>(d) Give the full form of QSAR.<br>(e) What is BLOSUM matrix?<br>(f) What is PIR?<br>(g) Differentiate between homology and analogy.<br>(h) What is the full form of PDB? |                  |

**GROUP-B**

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|----|--|---|
| 2. | Answer any <i>three</i> questions from the following:  | $5 \times 3 = 15$                                       |
|    | (a) Give an account of the different branches of bioinformatics.<br>(b) What is the full form of EMBL? How would you submit a sequence in EMBL?<br>(c) What is a clade? Differentiate between maximum parsimony and maximum likelihood method.<br>(d) Write short notes on:<br>(i) Protein database<br>(ii) Gene expression database.<br>(e) What is GenBank? Describe the process of sequence submission in NCBI. | 5<br>1+4<br>2+3<br>$2\frac{1}{2} + 2\frac{1}{2}$<br>2+3 |

**GROUP-C**

- |    |  |                           |
|----|--|---------------------------|
| 3. | Answer any <i>two</i> questions from the following:  | $10 \times 2 = 20$        |
|    | (a) What is a data? Give an account of the classification of biological databases.<br>(b) Write notes on:<br>(i) DDBJ<br>(ii) Swiss-Prot.<br>(c) Describe the various applications of bioinformatics in biological sciences.<br>(d) What is clustering? What are rooted and unrooted trees? Explain the concepts of bootstrapping and jackknifing. | 2+8<br>5+5<br>10<br>2+2+6 |

**PAPER-3**  
**STRESS BIOLOGY**  
**GROUP-A**

1. Answer any *five* questions from the following:  $1 \times 5 = 5$
- (a) Define acclimation.
  - (b) What is permanent wilting point?
  - (c) What are glycophytes?
  - (d) What are phytoalexins? Name any one phytoalexin.
  - (e) What is the nature of plasma membrane of cold resistant plant?
  - (f) What are compatible osmolytes? Give examples.
  - (g) Write the full form of ROS.
  - (h) Name any two antioxidant enzymes involved in stress management.

**GROUP-B**

2. Answer any *three* questions from the following:  $5 \times 3 = 15$
- (a) Write a note on systemic acquired resistance mechanism. 5
  - (b) Discuss in brief about calcium modulation in plants during stress. 5
  - (c) Mention the adaptive features of saline resistant plants. 5
  - (d) Enumerate the role of jasmonates in insect and disease resistance. 5
  - (e) Provide a brief account on role of compatible solutes in plants during stress management. 5

**GROUP-C**

3. Answer any *two* questions from the following:  $10 \times 2 = 20$
- (a) Describe the hypersensitive reaction occurred in plants during pathogen attack. 10
  - (b) Give an account on pathogenesis related (PR) proteins with reference to their role in plant defence mechanism. 10
  - (c) Discuss the phospholipid signalling mechanism involved in stress sensing mechanism in plants. 10
  - (d) Write short notes on:  
 (i) Physical defence mechanism  
 (ii) Physiological defence mechanism.  $5 \times 2 = 10$

**PAPER-4**  
**PLANT BREEDING**  
**GROUP-A**

1. Answer any *five* questions from the following:  $1 \times 5 = 5$
- (a) Define polyploidy.
  - (b) What are plant genetic resources?
  - (c) What are the advantages of mass selection?
  - (d) Name two cross pollinated crops.
  - (e) What is emasculation?
  - (f) What is pure line selection?

- (g) Name two chemicals used in male-sterility method.
- (h) Define the term acclimatization.

### **GROUP-B**

2. Answer any ***three*** questions from the following:  $5 \times 3 = 15$
- (a) Give a comparative account between monogenic inheritance and polygenic inheritance. 5
  - (b) Describe the role of mutations in crop improvement. 5
  - (c) What is inbreeding depression? Mention its demerits. 2+3
  - (d) Illustrate the acclimatization methods for crop improvement. 5
  - (e) Briefly explain quantitative inheritance of skin colour in human beings. 5

### **GROUP-C**

3. Answer any ***two*** questions from the following:  $10 \times 2 = 20$
- (a) Give an account on the important achievements and undesirable consequences of plant breeding. 5+5
  - (b) Elucidate the procedure, advantages and limitations of self pollinated plants. 6+2+2
  - (c) Define the term quantitative inheritance. Briefly explain quantitative inheritance of Kernel colour in wheat. 2+8
  - (d) What is hybridization? Briefly describe the role of hybridization in crop improvement. 2+8

## **PAPER-5**

### **NATURAL RESOURCE MANAGEMENT**

### **GROUP-A**

1. Answer any ***five*** questions from the following:  $1 \times 5 = 5$
- (a) Give the full form of IPR.
  - (b) Write any two benefits related to nuclear energy.
  - (c) Define afforestation.
  - (d) List two traditional system of water harvesting.
  - (e) Define fossil fuel.
  - (f) What is Red Data Book?
  - (g) What do you mean by endemic species?
  - (h) Define estuary.

### **GROUP-B**

2. Answer any ***three*** questions from the following:  $5 \times 3 = 15$
- (a) Write a brief note on use of GIS in resource management. 5
  - (b) Explain the role of Public Participation in environmental assessment with examples. 5
  - (c) What is Ramsar convention? Mention its functions.  $2\frac{1}{2} + 2\frac{1}{2}$
  - (d) Write note on Solid Waste Management. 5
  - (e) Discuss the role of CBD in addressing wildlife issues. 5

**GROUP-C**

3. Answer any ***two*** questions from the following:  $10 \times 2 = 20$
- (a) What are the causes of soil degradation? Write about the management of soil degradation.  $4+6$
  - (b) Discuss in detail about the ecological footprint with special reference to carbon footprint.  $10$
  - (c) Explain the concept of EIA in developing countries with examples.  $10$
  - (d) Write short notes on:
    - (i) Renewable and non-renewable sources of energy
    - (ii) Threats to biodiversity. $5 \times 2 = 10$

**PAPER-6****HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY****GROUP-A**

1. Answer any ***five*** questions from the following:  $1 \times 5 = 5$
- (a) Name two ornamental flowering trees suitable for avenues.
  - (b) Name two varieties of mango available in the markets of North Bengal.
  - (c) Define drip irrigation methods.
  - (d) Name two biofertilizers frequently used in Horticulture.
  - (e) Mention two objectives of urban forestry.
  - (f) Write down two advantages of food irradiation.
  - (g) Define varieties. Give example.
  - (h) Name two common diseases of fruit crops.

**GROUP-B**

2. Answer any ***three*** questions from the following:  $5 \times 3 = 15$
- (a) Explain the role of horticulture in rural economy and employment generation.
  - (b) Mention the salient features of gerberas.
  - (c) Briefly describe the economic products of fruit crops of Northern Part of West Bengal.
  - (d) How the quality traits of horticultural crops are evaluated?
  - (e) Write a short note on food safety.

**GROUP-C**

3. Answer any ***two*** questions from the following:  $10 \times 2 = 20$
- (a) Describe the role of micropropagation in Horticultural practice. Mention its limitations.
  - (b) Explain in detail the role of flower shows and exhibitions in promoting horticulture.
  - (c) Write an essay on ornamental flowering trees and their features.
  - (d) Discuss about the layout of an ideal park for children and the plant species suitable for it.

**PAPER-7**  
**RESEARCH METHODOLOGY**  
**GROUP-A**

1. Answer any *five* questions from the following:  $1 \times 5 = 5$

- (a) What is GFP?
- (b) What do you mean by proteomics?
- (c) Define plagiarism.
- (d) What is molar solution?
- (e) Why pretreatment is necessary for squash preparation?
- (f) What type of imaging technique needs to be used in studying ribosomes and protein synthesis?
- (g) Give example of an acidic dye.
- (h) What is empirical research?

**GROUP-B**

2. Answer any *three* questions from the following:  $5 \times 3 = 15$

- (a) Distinguish between applied and fundamental research. 5
- (b) What is a model organism? Mention one such organism used in the field of molecular biology research and state why it is a preferred model? 1+4
- (c) Give an outline about the writing of references in scientific journals. 5
- (d) Give an account on qualitative and quantitative research methodology. 5
- (e) Mention the rationale behind dehydrating tissue sections through graded solvent series. 5

**GROUP-C**

3. Answer any *two* questions from the following:  $10 \times 2 = 20$

- (a) Write short notes on:
  - (i) Plagiarism
  - (ii) Serial dilution method.5+5
- (b) Name four common hazardous laboratory chemicals. Mention the type of hazard they can cause and state the precautions to be maintained while handling those chemicals. 10
- (c) What is stain? Classify stains based on their chemistry. Describe the process of gram staining. 1+3+6
- (d) Write short notes on:
  - (i) Chemical Fixative
  - (ii) Fluorescent Dye.5+5

**PAPER-8**

**INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY**

**GROUP-A**

1. Answer any *five* questions from the following:  $1 \times 5 = 5$

- (a) Why are microbes important?
- (b) What causes high COD in water?
- (c) How are microbes used in industrial production?
- (d) What is a pathogen?

- (e) Name one microorganism used in everyday life.
- (f) Name some bacteria found in drinking water.
- (g) Define eutrophication.
- (h) What is the safe TDS of drinking water?

**GROUP-B**

2. Answer any **three** questions from the following:  $5 \times 3 = 15$
- (a) What are the types of water inhabited by microorganisms? Write down the characteristics of aquatic microorganism.  $2+3$
  - (b) Discuss the role of microorganisms as indicators of water quality.  $5$
  - (c) How is ethanol fermented? Write down the principle of industrial production of ethanol.  $1+4$
  - (d) What are the two main organic acids produced by bacterial fermentation? Mention the uses of organic acids.  $2+3$
  - (e) Write down the application of microbial enzymes in Food Industry.  $5$

**GROUP-C**

3. Answer any **two** questions from the following:  $10 \times 2 = 20$
- (a) Define symbiosis. Discuss the symbiotic relationship between *Rhizobium* and *Leguminous* plants. What type of Nitrogen fixation takes place here?  $2+6+2$
  - (b) How is Penicillin made by fermentation? Discuss the mechanism for industrial production of Penicillin.  $4+6$
  - (c) What is immobilization of enzymes? What are the advantages and application of immobilized enzymes in food industry?  $3+7$
  - (d) Discuss the various role of microbes in industrial products. What is downstream processing? Write down the significance of downstream processing.  $4+3+3$

**PAPER-9**

**BIOSTATISTICS**

**GROUP-A**

1. Answer any **five** questions from the following:  $1 \times 5 = 5$
- (a) What is null hypothesis?
  - (b) Find out the missing figure:  
Mean – Mode = ? (Mean – Median)
  - (c) What is Random Sampling?
  - (d) What do you understand by Degrees of Freedom?
  - (e) What does a large value of standard deviation indicate?
  - (f) Define Correlation. State the range of Pearson's Correlation coefficient.
  - (g) What is ANOVA?
  - (h) Find the geometric mean of 12 and 27.

**GROUP-B**

2. Answer any ***three*** questions from the following:  $5 \times 3 = 15$

- (a) What do you understand by central tendency of a univariate data-set? Write down the formula of geometric mean in large number of observations. Briefly discuss the merits and demerits of Arithmetic mean. 1+1+3

- (b) An observation of 32 Balsam plants shows the following data. Calculate the mode value. 5

No. of Flowers /Plant ( $x$ )	4	5	6	7	8	9
No. of Plants ( $f$ )	3	5	6	9	5	4

- (c) Why sampling is essential to the study of Biostatistics? Briefly discuss the ideal criteria of a good sampling from a plant population. 2+3

- (d) When will you perform the paired t-test and when will you follow unpaired t-test? Write down the formula for calculating the 't' value in both the processes. 3+2

- (e) The scores of two batsman, A and B, in 5 innings during a certain season, are as under: 5

Batsman A	32	39	10	96	60
Batsman B	19	90	10	40	62

Find which of the batsman is more consistent in scoring?

**GROUP-C**

3. Answer any ***two*** questions from the following:  $10 \times 2 = 20$

- (a) Length of Panicle and Number of grains were correlated in 10 randomly selected rice plants in the following way: 10

Length of Panicle (cm)	No. of gains
10.0	65
12.5	102
15.0	105
12.0	85
16.0	115
11.0	72
14.5	85
17.0	110
14.0	92
10.5	75

Calculate the Pearson's Co-efficient of Correlation ( $r$ ) and interpret it.

- (b) 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

- (c) Calculate the arithmetic mean and standard deviation of the following distribution: 5+5

Class intervals	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency ( $f$ )	2	5	7	13	21	16	8	3

- (d) Write short notes on: 5+5

- (i) Histogram
- (ii) Merits and demerits of Range and Standard Deviation.

