WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTACOR13T-BOTANY (CC13)

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1. Answer ***all*** questions briefly from the following: 1×6 = 6

   (a) What do you mean by substrate level phosphorylation?

   (b) Write down the structure of ATP.

   (c) What are diazotrophs?

   (d) What is α-oxidation of fatty acids?

   (e) Define biosignalling.

   (f) Name one inhibitor of photosynthetic electron transport chain.

2. Answer any ***eight*** questions from the following: 3×8 = 24

   (a) What do you understand by chloroplast dimorphism in C_4 plants?

   (b) Briefly explain the process of sucrose synthesis.

   (c) Schematically represent Crassulacean acid metabolism.

   (d) Write a short note on mitochondrial electron transport chain.

   (e) State the dual role of RUBISCO.

   (f) Mention three important differences between C_4 and CAM plants.

   (g) Is glycolysis an oxidative process? If yes, then why?

   (h) In schematic form enumerate the oxidation of cytosolic $NADH^+ + H^+$ by malate aspartate shuttle.

   (i) Schematically show the biochemical reactions of triglyceride synthesis.

   (j) Write a note on chemiosmotic theory in relation to ATP synthesis.

   (k) Discuss the role of uncouplers in oxidative phosphorylation.

   (l) Write a note on the receptors involved in signal transduction pathway.

3. Answer any ***two*** questions from the following:

(a) Give a schematic representation of C_3 cycle mentioning the enzymes involved in each step.

(b) Write down three irreversible reactions taking place during glycolysis.

(c) Discuss the infection process during nodule organogenesis in symbiotic nitrogen fixation with illustrations.

(d) Write down a short note on MAPK cascade.

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTACOR14T-BOTANY (CC14)

PLANT BIOTECHNOLOGY

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
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All symbols are of usual significance.

1. Answer the following questions in brief: 1×6 = 6

   (a) What are fusogens?
   (b) What is colony hybridization?
   (c) What is humulin?
   (d) What is shuttle vector?
   (e) What is palindromic sequence?
   (f) Define electroporation.

2. Answer any ***eight*** questions from the following: 3×8 = 24

   (a) What are the prerequisites of an efficient plasmid vector?
   (b) How can micropropagation contribute to germplasm conservation?
   (c) Why is hardening process required before planting tissue cultured plants in the field? Describe the processes. $1\frac{1}{2}+1\frac{1}{2}$
   (d) What is somatotropin? What are the approved uses of recombinant form of this hormone? 1+2
   (e) Describe plant tissue culture technique that is used in the production of secondary metabolite.
   (f) What is cryopreservation? Write down the different steps involved in a typical cryopreservation protocol. 1+2
   (g) Briefly discuss the strategies for the production of edible vaccine in plants. State two advantages of edible vaccine over traditional vaccine. 2+1
   (h) Write the steps involved in PCR.
   (i) Write the types of restriction enzymes with example.
   (j) Mention the sources and uses of three industrial enzymes.
   (k) Write the steps of gene cloning in bacteria.
   (l) What are the biosafety concerns related to GMO?

3. Answer any ***two*** from the following:

(a) Write the application of somatic embryogenesis. Compare hybrid with cybrid.

(b) What are transgenic plants? With particular emphasis on 'Golden rice', briefl discuss how nutritional quality of crop plants can be improved using transgenic approach.

(c) Why T-DNA from wild type Ti plasmid cannot be used directly as vectors? Briefly discuss, how Ti based vectors are designed for gene transfer in plants. 1+4

(d) What is restriction mapping? Describe in brief, the experimental procedure in generating restriction maps. How many fragments will be generated in a circular DNA cut with restriction enzyme that has two restriction sites on the DNA? 1+3+1

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTADSE04T-BOTANY (DSE3/4)

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks. Candidates should answer in their own words and adhere to the word limit as practicable.

প্রান্তিক সীমার মধ্যস্থ সংখ্যাটি পূর্ণ মান নির্দেশ করে। পরীক্ষার্থীরা নিজের ভাষায় যথা সম্ভব শব্দসীমার মধ্যে উত্তর করিবে।

1. Answer the following questions: 1×16 = 16

নিম্নলিখিত প্রশ্নগুলির উত্তর দাওঃ

(a) What is negative staining?
নেগেটিভ স্টেনিং কি ?

(b) Give full form of FISH.
FISH-এর পুরো নাম কি ?

(c) Write the full form of TEM.
TEM-এর পুরো কথাটি লেখো।

(d) What is the working principle of Confocal Microscopy?
কনফোকাল মাইক্রোস্কোপির কার্য পদ্ধতিটি কি ?

(e) Name one synthetic gel which is used for protein separation.
প্রোটিন বিশ্লেষণে ব্যবহৃত একটি ‘‘সিন্থেটিক জেল’’-এর নাম লেখো।

(f) What do you mean by Mean deviation in biostatistics?
জীবপরিসংখ্যানবিদ্যায় গড় বিচ্যুতি বলতে কি বোঝো ?

(g) Mention two important applications of autoradiography in biological science.
জীববিদ্যায় অটোরেডিওগ্রাফির দুটি গুরুত্বপূর্ণ প্রয়োগ সম্পর্কে আলোচনা করো।

(h) What is radioisotope? Give an example.
তেজস্ক্রিয় আইসোটোপ কি ? একটি উদাহরণ দাও।

(i) State two application of spectroscopy in biological research.
জীববিদ্যা গবেষণায় স্পেক্ট্রোস্কোপির দুটি প্রয়োগ উল্লেখ করো।

(j) What is the full form of HPLC?
HPLC-এর পুরো নাম লেখো।

(k) What is the working principle of molecular sieve chromatography?
মলিকিউলার সীভ ক্রোমাটোগ্রাফির কার্য পদ্ধতিটি কি ?

(l) What are the mobile phase and stationary phase in TLC?
TLC-তে মোবাইল ফেজ ও স্টেশনারী ফেজ কোনটি ?

(m) For which purpose agarose gel electrophoresis is used?
কি উদ্দেশ্যে অ্যাগারোজ জেল ইলেকট্রোফোরেসিস ব্যবহৃত হয় ?

(n) Define sample and population.
স্যাম্পেল ও পপুলেশন-এর সংজ্ঞা দাও।

(o) What is mode?
মোড কি ?

(p) Define variance.
ভেরিয়েন্স-এর সংজ্ঞা দাও।

2. Answer any ***eight*** questions from the following: 3×8 = 24
নিম্নলিখিত যে-কোনো ***আটটি*** প্রশ্নের উত্তর দাওঃ

(a) Write a short note on sample preparation for electron microscopy.
ইলেকট্রন মাইক্রোস্কোপির নমুনা প্রস্তুতির উপর একটি সংক্ষিপ্ত টীকা লেখো।

(b) Discuss about the working principle of flow cytometry.
ফ্লো সাইটোমেট্রির কার্যপ্রণালীটি আলোচনা করো।

(c) Write the differences between normal tabletop centrifuge and ultracentrifuge.
সাধারণ টেবিলটপ সেন্ট্রিফিউজ ও আল্ট্রাসেন্ট্রিফিউজ-এর মধ্যে পার্থক্যগুলি লেখো।

(d) Write a short note on TLC.
TLC-এর উপর টীকা লেখো।

(e) Write down the uses of radioisotope in biological research. Name one fluorescent stain which is used in Fluorescent Microscopy.
রেডিও আইসোটোপের জীববিদ্যায় ব্যবহারগুলি লেখো। ফ্লুরোসেন্ট মাইক্রোস্কোপিতে ব্যবহৃত একটি ফ্লুরোসেন্ট স্টেন-এর নাম লেখো।

(f) Write a short note on 'Agarose Gel Electrophoresis'.
অ্যাগারোজ জেল ইলেক্ট্রোফোরেসিস-এর উপর সংক্ষিপ্ত টীকা লেখো।

(g) State the differences between Ion exchange and Affinity chromatography.
আয়ন এক্সচেঞ্জ ও এফিনিটি ক্রোমাটোগ্রাফির মধ্যে পার্থক্যগুলি লেখো।

(h) Discuss about different methods of Gel Electrophoresis.
জেল ইলেক্ট্রোফোরেসিসের বিভিন্ন পদ্ধতি সম্বন্ধে আলোচনা করো।

(i) What is standard deviation? Discuss with formula.
স্ট্যান্ডার্ড বিচ্যুতি কি ? সূত্রের সাহায্যে বর্ণনা করো।

(j) In laboratory, researchers had repeated some of Mendel's experiment and reported the following results were shown in F_2 generation with seed colour in peas. Yellow coloured seed 115 and green coloured seed 65. Calculate the Goodness of Fit for these data. [1 df = 3.841 at 5% level of table value]

পরীক্ষাগারে গবেষকের, মটর গাছ নিয়ে মেন্ডেলের পরীক্ষার পুনরাবৃত্তি করাকালীন F_2 জনুতে হলুদ বর্ণের বীজ 115টি এবং সবুজ বর্ণের 65টি বীজ পেলেন। এই ফলাফলের উপর ভিত্তিতে ''গুডনেস অফ ফিট'' নির্ণয় করো।

(k) Define and explain the relationship between mean, median and mode.

Mean, median এবং mode-এর মধ্যে সম্পর্ক সংজ্ঞায়িত করো এবং ব্যাখ্যা করো।

(l) Why standard deviation considered to be the most useful method for measurement of dispersion of a series of data?

কেন স্ট্যান্ডার্ড ডেফিয়েশন ডেটা সিরিজ-এর বিচ্ছুরণ পরিমাপের জন্য সবচেয়ে দরকারী পদ্ধতি হিসেবে বিবেচিত হয় ?

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTADSE05T-BOTANY (DSE3/4)

BIOINFORMATICS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1. Answer ***all*** the following questions briefly: 1×16 = 16

(a) What is a cladogram?

(b) Define orthologs.

(c) What is dynamic programming?

(d) What is CLUSTAL W?

(e) Name a software used to create phylogenetic tree.

(f) Define FASTA.

(g) Name the NCBI database for transcriptomic data.

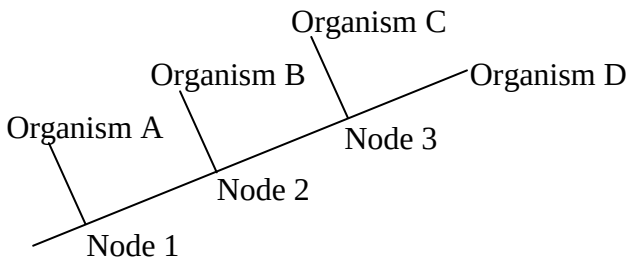
(h) Name two tools used in phylogenetic analysis.

(i) What is consensus sequence?

(j) Define molecular docking.

(k) What is MSA?

(l) In the diagram which node represents the most recent common ancestor for organism B and C?



(m) What is e-value of alignment score?

(n) Which kind of mutation is more likely to be encountered: Transition or transversion?

(o) Expand DDBJ.

(p) Define topology.

2. Answer any ***eight*** questions from the following:

(a) What is PIR? Describe the various resources of PIR.

(b) What do you understand by sequence alignment? Differentiate between global and local alignment.

(c) Discuss the importance of publically available biological databases in Bioinformatics. 3

(d) State principle of parsimony. What are the basic premises of concept of biological parsimony? 1+2

(e) What is Bootstrap test? What are its application and limitations? 1+2

(f) What is bioinformatics? Mention its role in crop improvement. 1+2

(g) Give one example each of (i) Nucleotide database, (ii) Protein database, (iii) Gene expression database.

(h) What is a BLAST tool used for? What is the format used for submitting a sequence in a search base? Name the type of blast program used for proteins and nucleotide sequences. 1+1+1

(i) Briefly explain how PAM is derived. 1+2

(j) What is genomics? How does bioinformatics support genomic research? 1+2

(k) Explain monophyletic group, paraphyletic group and polyphyletic group with the help of a diagram. 1+1+1

(l) Define the following terms: 1+1+1

(i) Lead compound

(ii) CADD

(iii) Virtual screening.

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

BOTADSE06T-BOTANY (DSE3/4)

Time Allotted: 2 Hours | Full Marks: 40

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1. Answer the following questions briefly: 1×16 =16

(a) Differentiate between primary data and secondary data.

(b) Why is standard deviation also known as root mean square deviation?

(c) If the arithmetic mean of x, $x+3$, $x+6$, $x+9$ and $x+12$ is 10, what is the value of x?

(d) How does an attribute differ from a parameter?

(e) What do you mean by level of significance?

(f) If the mode and median coincide, then what will be the shape of a normal curve?

(g) Chi-square test value _____ with the increase in the degree of freedom (decreases / increases).

(h) Write one difference between alternative hypothesis and null hypothesis.

(i) Find the median of the first ten prime numbers.

(j) Find the mean of the first 10 multiples of 3.

(k) What do you mean by sampling error?

(l) Work out the second quartile for the given series of 10, 12, 13, 15, 17, 19, 21 and 27.

(m) If in a calculation, there is 3 degree of freedom, write the number of classes present there.

(n) Define co-efficient of variation.

(o) What are the different types of correlation present between two sets of variable?

(p) The mean of the number 6, y, 7, x, 14 is 8. Express y value in terms of x.

2. Answer any ***eight*** questions from the following: 3×8 = 24

(a) "Arithmetic mean is the best measure of the central tendency and is widely used". Comment on this statement and give reasons in support of your view.

(b) With the help of a flowchart, explain the different steps involved in performing a student 't' test.

(c) If the mean of the following distribution is 24, find the value of '*a*'.

0-10	10-20	20-30	30-40	40-50
7	*a*	8	10	5

(d) Given two lines of regression $x+3y=11$ and $2x+y=7$. Find the coefficient of correlation between *x* and *y*.

(e) The mean height of 8 plants is 152 cm. Two more plants of height 143 cm and 156 cm are included later in the group. What is the new mean height of the plant?

(f) The weight of 10 students are given below in kg: 2+1
39, 43, 36, 38, 46, 51, 33, 44, 44, 43. Find the mode of this data. Is there more than 1 mode? If yes, why?

(g) From the following two equations, find out the mean value of the variable x and y; if we assume $x=\bar{x}$ and $y=\bar{y}$

$$2x+5y-4=0 \text{ and } x+7y+6=0.$$

(h) The following results were obtained in an experiment involving shape of the seeds and the colour of pods as follows:

Round yellow = 317, round green = 109, wrinkled yellow = 102, wrinkled green = 32. Test whether the ratio of 9:3:3:1 is maintained or not.

[Table value at 5% level of significance is 7.81]

(i) What do you understand by the term frequency distribution? Define frequency curve and frequency polygon. 1+1+1

(j) Find the value of f_1 and f_2 in the following frequency distribution table, if $n=100$ and the median is 32.

0-10	10-20	20-30	30-40	40-50	50-60
10	f_1	25	30	f_2	10

(k) How population is defined in a biometrical analysis? Which is the most widely used measure of dispersion and why? 1+2

(l) If each of the observation x_1, x_2, x_3..... x_n is increased by '*a*', where '*a*' is a negative or positive number, show that the variance remains unchanged.

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

BOTACOR13T-BOTANY (CC13)

Time Allotted: 2 Hours | Full Marks: 40

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All symbols are of usual significance.

1. Answer ***all*** questions briefly from the following: 1×6 = 6

   (a) What do you mean by anabolic pathway? Give an example.

   (b) Name CO_2 acceptors in C3 and C4 plants.

   (c) Mention the role of leghaemoglobin in nitrogen fixation.

   (d) What is chemiosmotic theory?

   (e) What are ligands?

   (f) Write down the structure of triglyceride.

2. Answer any ***eight*** questions from the following: 3×8 =24

   (a) Write a short note on Q cycle.

   (b) Write the structure of chlorophyll b.

   (c) "Photorespiration is necessary for all organisms performing oxygenic photosynthesis." — Justify the statement with reasons.

   (d) Mention the difference between photophosphorylation and oxidative phosphorylation.

   (e) Describe the biochemical reactions for conversion of Pyruvic acid to Acetyl-coA.

   (f) State the significance of cyanide resistance respiration.

   (g) What do you understand by Kranz anatomy? What are the advantages of C4 photosynthesis? 2+1

   (h) Schematically present the Z-scheme of photosynthetic light reaction.

   (i) Write down the reaction catalysed by GS-GOGAT pathway.

   (j) Discuss the significance of hexose monophosphate shunt.

   (k) Schematically show the biochemical reactions of β oxidation of fatty acids.

   (l) Schematically represent the Ca-calmodulin mediated signal transduction in plants.

3. Answer any ***two*** questions from the following:

(a) Write down the structure and function of the enzyme nitrogenase.

(b) Briefly discuss the different types of phosphorylation found in plant metabolism.

(c) Write down the structure and function of ATP synthase.

(d) Discuss the role of trimeric G-protein in the cellular signal transduction.

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

BOTACOR14T-BOTANY (CC14)

PLANT BIOTECHNOLOGY

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.

1. Answer the following questions in brief: 1×6 = 6

   (a) What is embryo rescue?

   (b) What is the role of osmoticum during isolation of protoplasts?

   (c) Define totipotency.

   (d) What is cybrid?

   (e) Which bacteria are capable to induce hairy root culture?

   (f) Name one high capacity cloning vector.

2. Answer any ***eight*** questions from the following: 3×8 = 24

   (a) Briefly describe the composition of plant tissue culture medium.

   (b) Describe one technique of protoplast isolation and fusion.

   (c) What is micropropagation? What are the advantages of micropropagation? 1+2

   (d) Briefly discuss the gene transfer methods using electroporation and particle gun bombardment.

   (e) How a somatic embryo differs from a zygotic embryo? Briefly describe the different stages of somatic embryo development in dicots. 1+2

   (f) How androgenic haploids are produced in culture? Mention two factors which affect haploid production in culture. 2+1

   (g) What do you mean by elicitation? How it can be used in the production of secondary metabolites in culture? 1+2

   (h) What do you mean by reporter gene? How GUS gene is used in plant transformation? 1+2

   (i) Define restriction enzyme. How do bacteria protect themselves from restriction enzymes? 1+2

   (j) Describe the strategy used for developing herbicide resistant soybean.

(k) Give example of a superbug and mention its role in bioremediation.

(l) What are the differences between YACs and BACs? What do you mean by MCS?

3. Answer any ***two*** from the following: 5×2 = 10

(a) Why is *Agrobacterium* referred to as a 'natural genetic engineer'? Draw the naturally occurring Ti plasmid of *Agrobacterium* with essential components. Specify the role of *vir* genes in *Agrobacterium*-mediated transformation. 1+3+1

(b) What is Bt-cotton and how was it developed?

(c) What is the difference between a genomic library and a c-DNA library? What are the major differences in the structure of a gene cloned into either type of library? Give an advantage of each type of clone. 2+2+1

(d) Briefly discuss the various methods of germplasm conservation. Name one cryoprotectant. 4+1

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

BOTADSE04T-BOTANY (DSE3/4)

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks. Candidates should answer in their own words and adhere to the word limit as practicable.

প্রান্তিক সীমার মধ্যস্থ সংখ্যাটি পূর্ণ মান নির্দেশ করে। পরীক্ষার্থীরা নিজের ভাষায় যথা সম্ভব শব্দসীমার মধ্যে উত্তর করিবে।

1. Answer the following questions: 1×16 = 16
নিম্নলিখিত প্রশ্নগুলির উত্তর দাওঃ

(a) What is RPM in centrifuge?
সেন্ট্রিফিউজে RPM বলতে কি বোঝো ?

(b) What do you mean by PAGE gel electrophoresis?
পেজ জেল ইলেক্ট্রোফোরেসিস বলতে কি বোঝো ?

(c) Name any two fluorescent dye commonly used in fluorescence microscopy.
Fluorescence মাইক্রোস্কোপিতে ব্যবহৃত হয় এরূপ দুটি রঞ্জকের নাম করো।

(d) Give full form of FACS.
FACS-এর পুরো কথাটি লেখো।

(e) Which force is used in centrifugation process?
Centrifugation process-এ কোন্ বল ব্যবহার করা হয় ?

(f) Mention the half life of ^{14}C.
^{14}C-এর অর্ধজীবনকাল কত ?

(g) Name a substance commonly used during autoradiography.
অটোরেডিওগ্রাফির সময় সাধারণত কোন্ পদার্থ ব্যবহার করা হয় ?

(h) State Beer and Lambert law.
Beer এবং Lambert-এর সূত্রটি লেখো।

(i) What is the full form of NMR?
NMR-এর পুরো কথাটি লেখো।

(j) Define R_f.
R_f-এর সংজ্ঞা দাও।

(k) Mention the full form of MALDI-TOF.
MALDI-TOF-এর পুরো কথাটি লেখো।

(l) What is SEM?
SEM কি ?

(m) What is the purpose of chromosomes banding?
ক্রোমোজোমদের ব্যান্ড করার উদ্দেশ্য কি ?

(n) What is standard deviation?
স্ট্যান্ডার্ড বিচ্যুতি কি ?

(o) If the weights of chili harvested from five plants are 45, 60, 48, 100, 65, 40 gm. Calculate the median.
পাঁচটি লঙ্কা গাছ থেকে 45, 60, 48, 100, 65, 40 গ্রাম লঙ্কা পাওয়া গেল। এদের মেডিয়ান নির্ণয় করো।

(p) What do you mean by distribution coefficient?
Distribution coefficient বলতে কি বোঝো ?

2. Answer any ***eight*** questions from the following: 3×8 = 24
নিম্নলিখিত যে-কোনো ***আটটি*** প্রশ্নের উত্তর দাওঃ

(a) What is resolution of a microscope? How does resolution depend upon the wavelength of light? 1+2
Microscope-এর resolution কি ? এটি কিভাবে আলোর তরঙ্গদৈর্ঘ্যের ওপর নির্ভর করে ?

(b) How does scanning electron microscopy differ from transmission electron microscopy?
Scanning electron microscopy ও Transmission electron microscopy-এর পার্থক্য লেখো।

(c) How is X-ray crystallography used to determine the structure of proteins? What is a centrifuge and what is it used for? 2+1
প্রোটিনের কাঠামো নির্ধারণ করতে কিভাবে এক্সরে স্ফটিকের ব্যবহার করা হয় ? সেন্ট্রিফিউজ কি এবং এটি কিসের জন্য ব্যবহৃত হয় ?

(d) Distinguish between differential and density gradient centrifugation.
Differential এবং Density gradient centrifugation-এর পার্থক্য লেখো।

(e) What is autoradiography? How is autoradiography used in biological research? 1+2
Autoradiography কি ? এটি জৈব গবেষণায় কিভাবে ব্যবহার হয় ?

(f) Mention the differences of Native PAGE and SDS PAGE.
Native PAGE ও SDS PAGE-এর পার্থক্য লেখো।

(g) What is λ_{max} ? Mention two applications of spectrophotometry. 1+2
λ_{max} কি ? Spectrophotometry-র দুটি উপযোগিতা লেখো।

(h) What are the advantages of TLC over Paper chromatography?
Paper Chromatography থেকে TLC বেশী সুবিধাজনক কেন ?

(i) How is polyacrylamide gel prepared?
কিভাবে polyacrylamide gel তৈরী করা হয় ?

(j) Write main differences between Gas Chromatography and Column Chromatography.
Gas Chromatography ও Column Chromatography-এর প্রধান পার্থক্যগুলি লেখো।

(k) Write a short note on central tendency.
Central tendency সম্পর্কে বর্ণনা করো।

(l) With a suitable formula, explain chi-square test.
সমীকরণসহ কাই-স্কোয়ার পরীক্ষাটি বর্ণনা করো।

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within* 1 *hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

BOTADSE05T-BOTANY (DSE3/4)

BIOINFORMATICS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.

1. Answer ***all*** the following questions briefly: 1×16 = 16

(a) What does NCBI stand for?

(b) What does in-silico mean?

(c) Name any two major public DNA databases.

(d) What is the purpose of using ClustalW?

(e) Why is the error of the unrooted tree topology smaller than that of the rooted tree?

(f) What is an accession number?

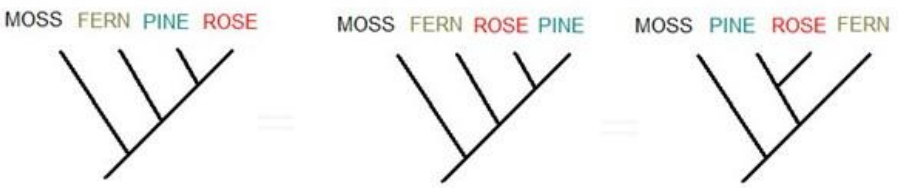
(g) What is PAM?

(h) What is the term used for a compound that has desirable properties to become a drug?

(i) What is synapomorphy?

(j) Name a software used to create a Phylogenetic tree.

(k) What does a topology in a phylogenetic tree indicate? Is the tree topology in the figure given below similar?



(l) Name a data retrieving tool.

(m) What do you understand by the term informative site?

(n) What type of knowledge database is UniProt ?

(o) What is transcriptomics?

(p) Name a software used to predict the structure of the protein from a given amino acid sequence.

2. Answer any ***eight*** questions from the following:

(a) Distinguish between a cladogram and a phenogram.

(b) Differentiate between orthologs and paralogs.

(c) Are the terms similarity and homology the same? Explain with the help of an example. 1+2

(d) What is FASTA? How is it represented? 3

(e) What is molecular clock hypothesis? Name the algorithm that uses it to build a phylogenetic tree. Name a biomarker (gene) that is most popularly used for preparation of phylogenetic trees in eukaryotic organisms. 3

(f) Write a short note on application of Bioinformatics in crop improvement. 3

(g) Write a short note on Primary and Secondary Biological Database. 3

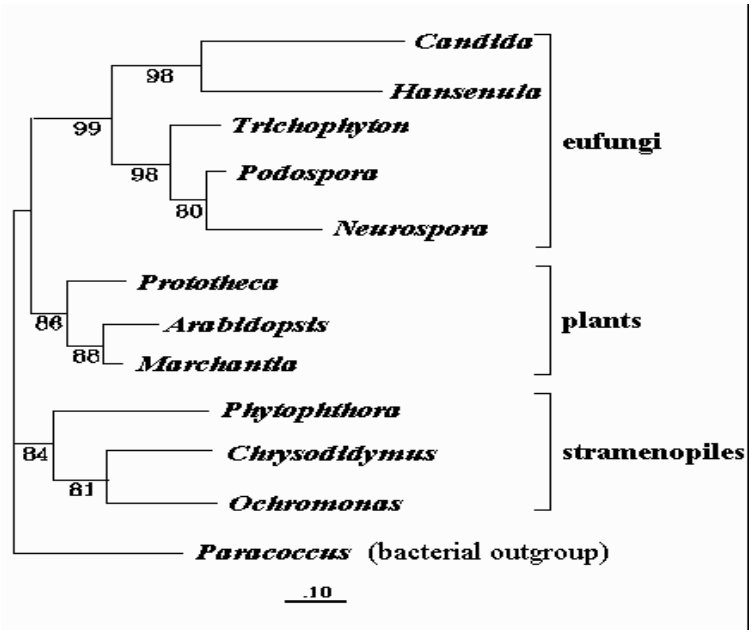
(h) Mention the importance of bioinformatics tools in drug design and discovery. 3

(i) In the figure given below identify 1+1+1

(I) the out-group

(II) any one polyphyletic group

(III) mention the significance of numerical values.



(j) What is molecular docking? Mention its application. 1+2

(k) What is a database? Mention the different types of protein sequence databases. Give an example of each type. 1+2

(l) What is Proteomics? Write a short note elaborating further on functional and structural proteomics. 3

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WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

BOTADSE06T-BOTANY (DSE3/4)

BIOSTATISTICS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks. Candidates should answer in their own words and adhere to the word limit as practicable.

প্রান্তিক সীমার মধ্যস্থ সংখ্যাটি পূর্ণমান নির্দেশ করে। পরীক্ষার্থীরা নিজের ভাষায় যথা সম্ভব শব্দসীমার মধ্যে উত্তর করিবে।

1. Answer the following questions briefly: 1×16 = 16

(a) How does a sample differ from a population?

(b) Define geometric mean.

(c) What do you mean by the term 'central tendency'?

(d) State the different types of data collection procedure.

(e) The mean of 6 observations is 17.5. If five of them are 14, 9, 23, 25 and 10, find the sixth observation.

(f) Define 'Null Hypothesis'.

(g) State the merits of Mode.

(h) What do the term 'degrees of freedom' mean?

(i) If the mean of observations $A_1, A_2, A_3 \ldots\ldots A_n$ is $\overline{A}$, which is the mean of new observations, when data are $A_1 + a, A_2 + a, A_3 + a \ldots\ldots A_n + a$

(i) $a\overline{A}$ (ii) $\overline{A} + a$ (iii) $\overline{A} - a$ (iv) $\overline{A} / a$

(j) State the different methods of data presentation.

(k) What are the measures of dispersion?

(l) What do you mean by student 't' test?

(m) If the mean of x_1, x_2 is 7.5 and the mean of x_1, x_2, x_3 is 8, then the value of x_3 is-

(i) 9 (ii) 8 (iii) 7.5 (iv) 6

(n) What is meant by 'regression of y on x'?

(o) Give the formula for χ^2 statistic.

(p) Write the formula of median when the number of observation is f and f is even.

2. Answer any ***eight*** questions from the following:

(a) Differentiate between histogram and bar diagram.

(b) What is a continuous variable? How does it differ from a discrete one?

(c) Mention merits and demerits of standard deviation.

(d) Critically compare correlation and regression.

(e) A study of the yield of 150 tomato plants resulted in the following record. Calculate the mean of the number of tomatoes per plant-

Tomatoes per plant	1-5	6-10	11-15	16-20	21-25
Number of pants	20	50	46	22	12

(f) If the numbers 11, 13, 15, 19, $p + 2$, $p + 4$, 30, 35, 39, 46 are in ascending order and their median is 25, calculate the value of p.

(g) The mean of the following distribution is 52 and the frequency of class interval 30-40 is f. Find the value of f .

10-20	20-30	30-40	40-50	50-60	60-70	70-80
5	3	f	7	2	6	13

(h) In a seed sample analysis, the following observations are found:

Brown large seed = 57

Brown small seed = 18

Yellow large seed = 18

Yellow small seed = 7

Determine the χ^2 value of the sample.

(i) The panicle length of two wheat varieties are recorded as follows:

Variety A	25	23	26	25	22	26	23	21	26	25
Variety B	22	24	29	24	23	18	19	23	24	19

Test whether the two varieties differ in respect to their character?
[use student's t test]

(j) What do you mean by tests of significance? What are the applications of χ^2 test in genetics?

(k) The following results were obtained for calculation the coefficient of correlation between the two variables i.e., x and y from 25 pairs of observations: [$\Sigma x = 125$, $\Sigma y = 100$, $\Sigma x^2 = 650$, $\Sigma y^2 = 460$, $\Sigma xy = 508$]. State the significance level of the correlation coefficient of the two variables.

(l) Graphically explain the following equation:

$$y = \alpha + \beta x$$

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Table I : Distribution of t

Degrees of freedom (n)	Probability, p					
	.2	1	.05	.02	.01	.001
1	3.078	6.314	12.606	31.821	63.657	636.619
2	1.886	2.920	4.303	6.965	9.925	31.598
3	1.638	2.353	3.182	4.541	5.841	12.924
4	1.533	2.132	2.776	3.747	4.604	8.610
5	1.476	2.015	2.571	3.365	4.032	6.869
6	1.440	1.943	2.447	3.143	3.707	5.959
7	1.415	1.895	2.365	2.998	3.499	5.408
8	1.397	1.860	2.306	2.896	3.355	5.041
9	1.383	1.833	2.262	2.821	3.250	4.781
10	1,372	1.812	2.228	2.764	3.169	4.587
11	1.363	1.796	2.201	2.718	3.106	4.437
12	1.356	1.782	2.179	2.681	3.055	4.318
13	1.350	1.771	2.160	2.650	3.012	4.221
14	1.345	1.761	2.145	2.624	2.977	4.140
15	1.341	1.753	2.131	2.602	2.947	4.073
16	1.337	1.746	2.120	2.583	2.921	4.015
17	1.333	1.740	2.110	2.567	2.898	3.965
18	1.330	1.734	2.101	2.552	2.878	3.922
19	1.328	1.729	2.093	2.539	2.861	3.883
20	1.325	1.725	2.086	2.528	2.845	3.850
21	1.323	1.721	2.080	2.518	2.831	3.819
22	1.321	1.717	2.074	2.508	2.819	3.792
23	1.319	1.714	2.069	2.500	2.807	3.767
24	1.318	1.711	2.064	2.492	2.797	3.745
25	1.316	1.708	2.060	2.485	2.787	3.725
26	1.315	1.706	2.056	2.479	2.779	3.707
27	1.314	1.703	2.052	2.473	2.771	3.690
28	1.313	1.701	2.048	2.467	2.763	3.674
29	1.311	1.699	2.045	2.462	2.756	3.659
30	1.310	1.697	2.042	2.457	2.750	3.646
40	1.303	1.684	2.021	2.423	2.704	3.551
60	1.296	.1.671	2.000	2.390	2.660	3.460
120	1.289	1.658	1.980	2.358	2.617	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.291

Table I is abridged from Table III of Fisher & Yates : *Statistical Tables for Biological, Agricultural and Medical Research*, published by Oliver & Boyd, Edinburgh.

Table IV : Values of F (variance ratio) at 0.001 probabi

Degrees of freedom, n_2	Degrees of freedom, n_1									
	1	2	3	4	5	6	8	12	24	∞
1	405	500	540	563	576	586	598	611	632	637
2	998.5	999.0	999.2	999.2	999.3	999.3	999.4	999.4	999.5	999.5
3	167.0	148.5	141.1	137.1	134.6	132.8	130.6	128.3	125.9	123.5
4	74.1	61.3	56.2	53.4	51.7	50.5	49.0	47.4	45.8	44.1
5	47.2	37.1	33.2	31.1	29.8	28.8	27.6	26.4	25.1	23.8
6	35.5	27.0	23.7	21.9	20.8	20.0	19.0	18.0	16.9	15.8
7	29.3	21.7	18.8	17.2	16.2	15.5	14.6	13.7	12.7	11.7
8	25.4	18.5	15.8	14.4	13.5	12.9	12.0	11.2	10.3	9.3
9	22.9	16.4	13.9	12.6	11.7	11.1	10.4	9.6	8.7	7.8
10	21.0	14.9	12.6	11.3	10.5	9.9	9.2	8.5	7.6	6.8
11	19.7	13.8	11.6	10.4	9.6	9.1	8.4	7.6	6.9	6.0
12	18.6	13.0	10.8	9.6	8.9	8.4	7.7	7.0	6.3	5.4
13	17.8	12.3	10.2	9.1	8.4	7.9	7.2	6.5	5.8	5.0
14	17.1	11.8	9.7	8.6	7.9	7.4	6.8	6.1	5.4	4.6
15	16.6	11.3	9.3	8.3	7.6	7.1	6.5	5.8	5.1	4.3
16	16.1	11.0	9.0	7.9	7.3	6.8	6.2	5.6	4.9	4.1
17	15.7	10.7	8.7	7.7	7.0	6.6	6.0	5.3	4.6	3.9
18	15.4	10.4	8.5	7.5	6.8	6.4	5.8	5.1	4.5	3.7
19	15.1	10.2	8.3	7.3	6.6	6.2	5.6	5.0	4.3	3.5
20	14.8	10.0	8.1	7.1	6.5	6.0	5.4	4.8	4.2	3.4
21	14.6	9.8	7.9	7.0	6.3	5.9	5.3	4.7	4.0	3.3
22	14.4	9.6	7.8	6.8	6.2	5.8	5.2	4.6	3.9	3.2
23	14.2	9.5	7.7	6.7	6.1	5.7	5.1	4.5	3.8	3.1
24	14.0	9.3	7.6	6.6	6.0	5.6	5.0	4.4	3.7	3.0
25	13.9	9.2	7.5	6.5	5.9	5.5	4.9	4.3	3.7	2.9
26	13.7	9.1	7.4	6.4	5.8	5.4	4.8	4.2	3.6	2.8
27	13.6	9.0	7.3	6.3	5.7	5.3	4.8	4.2	3.5	2.8
28	13.5	8.9	7.2	6.3	5.7	5.2	4.7	4.1	3.5	2.7
29	13.4	8.9	7.1	6.2	5.6	5.2	4.6	4.1	3.4	2.6
30	13.3	8.8	7.1	6.1	5.5	5.1	4.6	4.0	3.4	2.6
40	12.6	8.3	6.6	5.7	5.1	4.7	4.2	3.6	3.0	2.2
60	12.0	7.8	6.2	5.3	4.8	4.4	3.9	3.3	2.7	1.9
120	11.4	7.3	5.8	5.0	4.4	4.0	3.6	3.0	2.4	1.5
∞	10.8	6.9	5.4	4.6	4.1	3.7	3.3	2.7	2.1	1.0

Table IV is taken from Fisher and Yates : *Statistical Tables for Biological, Agricultural and Medical Research*, Published by Oliver & Boyd, Edinburgh.

Table V : Distribution of χ^2

Probability, p

Degrees of freedom (n)	.99	.98	.95	.90	.80	.50	.20	.10	.05	.02		
1	$.0^3157$	$.0^3628$	.00393	.0158	.0642	.455	1.642	2.706	3.841	5.412		
2	.0201	.0404	.103	.211	.446	1.386	3.219	4.605	5.991	7.824		
3	.115	.185	.352	.584	1.005	2.366	4.642	6.251	7.815	9.837		
4	.297	.429	.711	1.064	1.649	3.357	5.989	7.779	9.488	11.668		
5	.554	.752	1.145	1.610	2.343	4.351	7.289	9.236	11.070	13.388		
6	.872	1.134	1.635	2.204	3.070	5.348	8.558	10.645	12.592	15.033	16.812	22.457
7	1.239	1.564	2.167	2.833	3.822	6.346	9.803	12.017	14.067	16.622	18.475	24.322
8	1.646	2.032	2.733	3.490	4.594	7.344	11.030	13.362	15.507	18.168	20.090	26.125
9	2.088	2.532	3.325	4.168	5.380	8.343	12.242	14.684	16.919	19.679	21.666	27.877
10	2.558	3.059	3.940	4.865	6.179	9.342	13.442	15.987	18.307	21.161	23.209	29.588
11	3.053	3.609	4.575	5.578	6.989	10.341	14.631	17.275	19.675	22.618	24.725	31.264
12	3.571	4.178	5.226	6.304	7.807	11.340	15.812	18.549	21.026	22.054	26.217	32.909
13	4.107	4.765	5.892	7.042	8.634	12.340	16.985	19.812	22.362	25.472	27.688	34.528
14	4.660	5.368	6.571	7.790	9.467	13.339	18.151	21.064	23.685	26.873	29.141	36.123
15	5.229	5.985	7.261	8.547	10.307	14.339	19.311	22.307	24.996	28.259	30.578	37.697
16	5.812	6.614	7.962	9.312	11.152	15.338	20.465	23.542	26.296	29.633	32.000	39.252
17	6.408	7.255	8.672	10.085	12.002	16.338	21.615	24.769	27.587	30.995	33.409	40.790
18	7.015	7.906	9.390	10.865	12.857	17.338	22.760	25.983	28.869	32.346	34.805	42.312
19	7.633	8.567	10.117	11.651	13.716	18.338	23.900	27.204	30.144	33.687	36.191	43.820
20	8.260	9.237	10.851	12.443	14.578	19.337	25.038	28.412	31.410	35.020	37.566	45.315
21	8.897	9.915	11.591	13.240	15.445	20.337	26.171	29.615	32.671	36.343	38.932	46.797
22	9.542	10.600	12.338	14.041	16.314	21.337	27.301	30.813	33.224	37.659	40.289	48.268
23	10.196	11.293	13.091	14.848	17.187	22.337	28.429	32.007	35.172	38.968	41.638	49.728
24	10.856	11.992	13.848	15.569	18.062	23.337	29.553	33.196	36.415	40.270	42.980	51.179
25	11.524	12.697	14.611	16.473	18.940	24.337	30.675	34.382	37.652	41.566	44.314	52.620
26	12.198	13.409	15.379	17.292	19.820	25.336	31.795	35.563	38.885	42.856	45.642	54.052
27	12.879	14.125	16.151	18.114	20.703	26.336	32.912	36.741	40.113	44.140	46.963	55.476
28	13.565	14.847	16.928	18.939	21.588	27.336	34.027	37.916	41.337	45.419	48.278	56.893
29	14.256	15.574	17.708	19.768	22.475	28.336	35.139	39.087	42.557	46.693	49.588	58.302
30	14.953	16.306	18.493	20.599	23.364	29.336	36.250	40.256	43.773	47.962	50.892	59.703

Table V is abridged from Table IV of Fisher & Yates : *Statistical Tables for Biological, Agricultural and Medical Research*, published by Oliver & Boyd, Edinburgh.

Table VI : Value of the Correlation Coefficient (r) fo levels of significance

Degrees of freedom (n)	.1	.05	.02		
1	.98769	.99692	.999507	.999877	.9999988
2	.90000	.95000	.98000	.990000	.99900
3	.8054	.8783	.93433	.95873	.99116
4	.7293	.8114	.8822	.91720	.97406
5	.6694	.7545	.8329	.8745	.95074
6	.6215	.7067	.7887	.8343	.92493
7	.5822	.6664	.7498	.7977	.8982
8	.5494	.6319	.7155	.7646	.8721
9	.5214	.6021	.6851	.7348	.8471
10	.4973	.5760	.6581	.7079	.8233
11	.4762	.5529	.6339	.6835	.8010
12	.4575	.5324	.6120	.6614	.7800
13	.4409	.5139	.5923	.6411	.7603
14	.4259	.4973	.5742	.6226	.7420
15	.4124	.4821	.5577	.6055	.7246
16	.4000	.4683	.5425	.5897	.7084
17	.3887	.4555	.5285	.5751	.6932
18	.3783	.4438	.5155	.5614	.6787
19	.3687	.4329	.5034	.5487	.6652
20	.3589	.4227	.4921	.5368	.6542
25	.3233	.3809	.4451	.4869	.5974
30	.2960	.3494	.4093	.4487	.5541
35	.2746	.3246	.3810	.4182	.5189
40	.2573	.3044	.3578	.3932	.4896
45	.2428	.2875	.3384	.3721	.4648
50	.2306	.2732	.3218	.3541	.4433
60	.2108	.2500	.2948	.3248	.4078
70	.1954	.2319	.2737	.3017	.3799
80	.1829	.2172	.2565	.2830	.3568
90	.1726	.2050	.2422	.2673	.3375
100	.1638	.1946	.2301	.2540	.3211

Table VI is abridged from Table VII of Fisher & Yates : *Statistical Tables for Biological, Agricultural and Medical Research*, published by Oliver & Boyd, Edinburgh.