CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, January 2023

Course Title: Biostatistics and Bioinformatics **Max. Time: 3 Hours**
Course Code: SIAS BT 1 3 01 C 4004 **Max. Marks: 70**

Instructions:

1. Question no. 1 has seven sub-parts and students need to answer any four. Each sub-part carries three and Half Marks.
2. Question no. 2 to 5 have three sub-parts and students need to answer any two sub-parts of each question. Each sub-part carries Seven Marks.

Question No 1. Answer the followings (Any four) (4 × 3.5=14)

a) Describe 'Bioinformatics' as a discipline with its major components.
b) What is primary and secondary databases with their applications?
c) Define sequence alignment and its major types in brief.
d) Explain meaning and ways to identify Open Reading Frame (ORF) in a given DNA sequence?
e) Write note on Random variable
f) Write note on Mathematical expectation
g) Write note on Mode

Question No. 2. (2 × 7=14)

a) Define probability. Two unbiased coins are thrown. Find the probability that: a) both the dice show the same number, b) the first die shows 6, c) the total of the numbers on the dice is 8.
b) What do you understand by measures of dispersion? Explain briefly the various methods used for measuring dispersion.
c) Define arithmetic mean and mention its properties? Write the advantages and drawbacks of arithmetic mean?

Question No. 3. (2 × 7=14)

a) Define Pearson's coefficient of correlation. Show that correlation coefficient is independent of origin and scale?
b) Write down the applications of chi-square (χ^2) distribution. Under what conditions chi-square (χ^2) test is valid.

c) Define normal distribution with its parameters? Write down the properties of normal distribution

Question No. 4. (2 × 7=14)

a) What is Computer Aided Drug Designing (CADD) and explain its major types.
b) Explain in detail about any two of these: PDB, SwissProt, NDB & TrEMBL.
c) What do you understand by NGS data and what are main formats of NGS datasets?

Question No. 5. (2 × 7=14)

a) What is homology, paralogy and orthology in biological context. Explain with examples.
b) What do you mean by next generation sequencing? Mention three major sequencing platforms for biological samples sequencing.
c) Why do we study phylogeny? What are the components of a phylogenetic tree and explain the UPGMA method of phylogenetic tree construction with suitable example?

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations January 2023

Programme: M.Sc. Biotechnology **Session: 2022-23**

Semester: Third **Max. Time: 3 Hours**

Course Title: Fermentation and Bioprocess Technology **Max. Marks: 70**

Course Code: SIAS BT 1 3 04 C 4004

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students need to answer any two parts of each question. Each part carries seven marks.

Q.1. (4X3.5=14)

a) What is thermal death point? How it is useful in a bioprocess.

b) Write under what conditions fed-batch, continuous and solid state fermentations are selected/performed.

c) What is yield coefficient. Write its significance in a bioprocess development.

d) What is biological mixture. Differentiate soluble and insoluble components of a biological mixture.

e) Explain briefly the comparative economics of downstream processing of a wild and a recombinant cellulase.

f) Write short note on synchronous culture.

g) Write flow diagram only for the production and downstream processing of penicillin.

Q 2. (2X7=14)

a) Explain how multiphase fermenter/bioreactor system can be utilized for the production of value-added products from rice straw.

b) What is solid state fermentation. Mushroom production is an example of solid state fermentation. Justify this statement with your answer.

c) Draw well labelled diagram of a stirred tank fermenter. Describe the structure and function of aeration system.

Q3. (2X7=14)

a) *Aspergillus niger* was cultivated in a medium containing sugarcane bagasse as a sole carbon source. Explain the biochemistry of the process. What happens if glucose is added in the medium.

b) Describe the effects of any four abiotic factors on the growth and metabolism of a mould cultivated in solid state fermentation.

c) Explain the steps for the formulation of a medium for the production of primary metabolite by a bacterial culture.

Q 4. (2X7=14)

a) What are industrially important microorganisms. How will you isolate such microorganisms from a given soil sample.

b) Explain different strategies for improving the production of useful products from bacteria and fungi

c) Describe the process for the production and purification of a recombinant protein in *E. coli*.

Q 5. (2X7=14)

a) Describe physical and chemical methods used to release intracellular products from a bacterial culture.

b) What is product drying. Explain any four methods used for the drying of industrial products.

c) Write short notes on any two: i) Ion exchange chromatography, ii) Protein crystallization, iii) Aqueous two phase system

Central University of Haryana

Term end Examination: January 2023

Program: M.Sc. (Biotechnology)

Semester: 3 Time: 3 Hours

Course Title: Animal Biotechnology Max. Marks: 70

Course code: SIAS BT 13 01 DCEC 3003

Question 1: (4×3.5=14)

(i) Differentiate between monolayer and suspension culture?

(ii) What is confluence and contact inhibition in cultured cells?

(iii) What do you understand by adult stem cell and feeder layer?

(iv) Write short note on embryo transfer in animals.

(v) What is calcium phosphate co-precipitation?

(vi) Write various application of transgenics?

(vii) Write names of gene transfer methods used in animals.

Unit 1: (2×7=14)

Q1. (a) Explain cell adhesion and cell adhesion molecules? (4 marks)

(b) What do you understand by cell differentiation? Discuss the factors involved in cell differentiation? (3 marks)

Q2. (a) Explain the basic techniques of *in-vitro* mammalian cell culture? (4 marks)

(b) Discuss the measuring parameters of growth in animal cell culture? (3 marks)

Q3. (a) Explain the cell viability and cell cytotoxicity? Discuss the procedure of cell cytotoxicity analysis for CHO cell line? (7 marks)

Unit 2: (2×7=14)

Q1. (a) Differentiate between Hollow fiber technique and Spheroid technique for histotypic culture? (4 marks)

(b) Explain somatic cell hybridization and whole embryo culture? (3 marks)

Q2. (a) Describe the development of embryonic stem cell? (4 marks)

(b) Explain the characteristics and differentiation of stem cell? (3 marks)

Q3. (a) Discuss major ethical issues associated with stem cell engineering? (3 marks)

(b) Discuss the commercial applications of animal cell and tissue culture. (4 marks)

Unit 3: (2×7=14)

Q1. Write detailed note on the manipulation of animal reproduction (7 marks).

Q2. Write notes on the following:

(a) Artificial insemination (2 marks)

(b) In-vitro fertilization (2 marks)

(c) Embryo transfer (3 marks)

Q3. What is probiotics? Describe the importance of probiotics with respect to human health (7 marks).

Unit 4: (2×7=14)

Q1. (a) Write about vectors for gene transfer in animals. (4 marks)

(b) Give details of selectable markers used in the animal cells culture. (3 marks)

Q2. Explain the various physical and chemical methods of gene transfer (7 marks)

Q3. Write short notes on:

(a) Transgene identification and integration methods (2 marks)

(b) Ethical issues in transgenics (2 marks)

(c) Genome edited animals (3 marks)

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, January 2023

Course Title: Basics of Bioinformatics **Max. Time: 3 Hours**

Course Code: SIAS BT 1 3 01 GEC 4004 **Max. Marks: 70**

Instructions:

1. Question no. 1 has seven sub-parts and students need to answer any four. Each sub-part carries three and Half Marks.
2. Question no. 2 to 5 have three sub-parts and students need to answer any two sub-parts of each question. Each sub-part carries Seven Marks.

Question No 1. Brief note on the followings (4 × 3.5=14)

a) What is the significance of DNA databases in biological sciences?
b) What do you understand by sequence alignments and its types?
c) Evolution can be studied by using phylogenetic tree. Explain with example.
d) Bioinformatics is a multidisciplinary branch of science, explain.
e) What do understand by Next Generation Sequencing (NGS) technology?
f) Explain the working of BLAST along with its types.
g) What are the various types of NGS datasets?

Question No. 2. (2 × 7=14)

a) What are the major types of Biological databases, write their significance with examples?
b) What are the major components of Computer-Aided Drug Designing? Write in detail.
c) "Genomics & Proteomics are integral parts of Bioinformatics". Explain with examples.

Question No. 3. (2 × 7=14)

a) What are the major components of a Phylogenetic tree? Explain the UPGMA approach of Phylogenetic tree construction.
b) What are the major types of sequence alignment? Explain each with suitable examples.
c) What is BLOSUM matrix? How it is different from PAM matrix. What are their respective applications?

Question No. 4. (2 × 7=14)

a) How Bioinformatics is playing role in studying evolution especially by sequence analysis. What do you understand by Orthology and paralogy?

b) What do you mean by Next Generation Sequencing platforms? Mention three major sequencing platforms for Biological samples sequencing.

c) Illumina, Nanopore and PacBio have revolutionized the field of Bioinformatics. What are these and how they have revolutionized the Bioinformatics field.

Question No. 5. (2 × 7=14)

a) What do you understand by data formats? What are various formats of NGS datasets?

b) How Whole Genome Sequencing is different from Whole Exome Sequencing? What are their respective applications with advantages and disadvantages?

c) Write in brief about these: Bowtie, FastQC, Sequencing depth, L50 & N50.

CENTRAL UNIVERSITY OF HARYANA

Term End Semester Examinations January 2023

Programme: **M.Sc. Biotechnology** **Session: 2022-23**

Semester: III **Max. Time: 3 Hours**

Course Title: Medical Biotechnology and Diagnostics **Max. Marks: 70**

Course Code: SIAL BT 1 3 08 C 4004

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a) Which mutation causes alpha 1 antitrypsin Pittsburg variant and what is its effect?

b) What is chorionic villi sampling, why it is done, and how it is different from amniocentesis?

c) What are carbon nanotubes and write their advantages?

d) How we can use smartphones in medical diagnostics?

e) What are dynamic mutations, Are these heritable?

f) Explain the role of CD 4 receptor in HIV infection.

g) How bacteria can be detected through molecular diagnostics?

Q 2. (2X7=14)

a) Explain gene-controlled diseases along with causes and treatment options if any?

b) How does the gain of function of oncogenes or loss of function of a tumor suppressor gene affects our body?

c) Explain in detail about different Numerical and structural chromosomal disorders.

Q3. (2X7=14)

a) What are monoclonal antibodies. How these are produced, and write their therapeutic applications?

b) Describe non-invasive technique and their advantages. How prenatal diagnosis is done through maternal blood?

c) How bcr-abl translocation is used in the diagnosis of chronic myeloid leukemia and through which methods?

Q 4. (2X7=14)

a) What are the advantages of molecular diagnostics and its scope for future therapeutics?

b) Describe in detail about the types, components & basic design of biosensors.

c) What is enzyme-linked immunosorbent assay. Explain its principle and procedure.

Q 5. (2X7=14)

a) Explain the principle and applications of quantitative real-time PCR.

b) What are DNA aptamers and how these can be utilized in biosensor for detection and diagnostic purposes.

c) What is molecular medicine, explain how padlock and selector probes can be applied in this field?

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations 2023

Programme: M. Sc Biotechnology **Session:** 2021-22

Semester: Third **Max. Time:** 3 Hours

Course Title: Biophysics and Nanosciences **Max. Marks:** 70

Course Code: Course Code: SIAS BT 1 3 02 C 4004

Instructions:
1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.
2 Question no 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Question No. 1 (4X3.5=14)

(a) Write a short on distribution of molecular velocities at equilibrium.
(b) Draw the structures of various phospholopids present in plasma membrane.
(c) Write the formulae for calculating free energy change due to chemical and electrical gradients.
(d) What is the function of flipase enzyme?
(e) Write a short note on the top down and bottom up approaches for nanoparticle synthesis.
(f) Write a short note on Nanomaterials used in biotechnology.
(g) Write a note on the water purification using nanotechnology.

Question No. 2 (2X7=14)

a) With regard to protein folding explain Levinthal paradox, molten globule and Anfinsen, s experiment.

b) Explain the principles and applications of fluorescence and circular dichroism spectroscopy.

c) Explain (with appropriate examples) the different types of forces and stereo-chemical factors responsible for molecular conformation.

Question No. 3
(2X7=14)

a) Explain the mechanism of action potential and its role in nerve impulse.

b) Write a detailed note on Patch clamp technique and Nernst equation.
c) Explain the fundamental roles of biomembranes.

Question No. 4

(2X7=14)

a) Write a note on the synthesis of nanoparticles by physical, chemical and biological methods.

b) Explain any four techniques for the size/shape determination of nanoparticles.
c) Explain the opportunities and promises in the field of nanobiotechnology.

Question No. 5

(2X7=14)

a) Explain the applications of nanotechnology in diagnosis of chronic diseases and in diagnosis of malaria.
b) Write a detailed note on the use of aptamers for nanobiosensing and insecticide development using nanotechnology.
c) Explain the role of nanotechnology in the field of bioremediation and oil spill removal.