Programme: Bachelor of Science (Bio-technology) Semester-II
Course Code: Biomathematics and Biostatistics
Course Code: BBTL-2333

Time Allowed: 3 Hours   **Maximum Marks: 80**

Note: Attempt five questions in all, selecting at least one from each section. The fifth question may be attempted from any section. Each question carries equal 16 marks. The students can use non storage and non-programmable calculator and statistical tables.

Section-A

Q.1 (a) Round off the given numbers to the four significant figures:
38.46235, 19.235101.

(b) Find the value of $\left(2^{\frac{1}{4}} - 1\right)\left(2^{\frac{3}{4}} + 2^{\frac{1}{2}} + 2^{\frac{1}{4}} + 1\right)$.

(c) Find the value of x which satisfies the relation $\log_{10} 3 +$
$\log_{10}(4x + 1) = \log_{10}(x + 1) + 1$.   (4,6,6)

Q.2 (a) Differentiate between Census and Sample Survey by giving four points.

(b) Find the derivative of the given function with respect to x:
$$y = \cos^{-1}\left(\frac{2x}{1 + x^2}\right), -1 < x < 1.$$

(c) Evaluate $\int \sqrt{3 - 2x - x^2}\, dx$.   (4,6,6)

Section-B

Q.3 (a) Find the quartiles and sixth decile from the following distribution.

Marks	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of students	4	15	27	32	23	18	11	5

(b) The arithmetic mean and standard deviation of 10 items is calculated as 20 and 4 but while calculating one item is wrongly taken as 15. Find the new mean and standard deviation if we delete this item from data.   (8,8)

Q.4 (a) The first three moments of a distribution about the value 5 of the variable are 2, 20 and 40. Find the mean, variance and the third moment about mean.

(b) Discuss the nature of the skewness of the following data:

Class	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16
Frequency	3	5	8	8	10	8	6	2

(8,8)

Section-C

Q.5 (a) Discuss normal distribution along with any of its four properties.

(b) The coefficient of correlation between X and Y is 0.5 for 20 observations with $\bar{X} = 12$ and $\bar{Y} = 10$; and $\sigma_X = 4$ and $\sigma_Y = 3$. At the time of verification it was discovered that one value of X=20 and of Y=15 are inaccurate. So, find the value of correlation of remaining 19 observations.

(8,8)

Q.6 (a) If Poisson distribution has a double mode at x=2 and x=3, what is the probability that x will have one or the other of these two values?

(b) Five coins are tossed simultaneously. Find the probability of getting
   (i) Three heads   (ii) at least three heads   (iii) at most one head.

(8,8)

Section-D

Q.7 (a) Compute the value of students t for the values in a sample of size eight consisting of
$-4, -2, -2, 0, \acute{2}, 2, 3$ and 3, taking the population mean as zero.

(b) 4 coins were tossed at a time and this operation is repeated 160 times. It is found that 4 heads occur 6 times, 3 heads occur 43 times, 2 heads occur 69 times and 1 head occur 34 times. Discuss whether the coin may be regarded as unbiased (use chi square value at 5% level of significance as 7.815)?

(8,8)

Q.8 (a) Two independent samples of 8 and 7 items respectively had the following values of the variable:

Sample I	9	11	13	11	15	9	12	14
Sample II	10	12	10	14	9	8	10	

Do the estimates of population variance differ significantly? Given that for 7 and 6 degrees of freedom the value of F at 5% level of significance is 4.20 nearly.

(b) Two independent samples of sizes 7 and 9 have the following values:

Sample A	10	12	10	13	14	11	10		
Sample B	10	13	15	12	10	14	11	12	11

Test whether the difference between the mean is significant (given tabulated value for t distribution at 5% level of significance with 14 degrees of freedom is 2.15).

(8,8)

Exam Code: 120602   Paper Code: 2199

Bachelor of Science (Bio-Technology) Semester: II

Course Title: Zoology - I

Course Code: BBTL-2484

Time Allowed: 3 Hours   Max Marks: 80

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 16 marks. Draw diagrams wherever necessary.

Section A

1. Write the characteristic features of Phylum Mollusca. Give examples.   (16)
2. What are various classes of Phylum Chordate? Give characteristics features of class Mammalia.   (16)

Section B

3. Draw a well labelled diagram of Human digestive system and explain it.   (16)
4. Write a note on oxygen dissociation curve.   (16)

Section C

5. Discuss the structure of Human Heart with the help of diagram.   (16)
6. Explain the mechanism of urine formation.   (16)

Section D

7. Discuss various hormones secreted by Pituitary gland and their functions.   (16)
8. A. What is resting membrane potential? Explain the origin and propagation of nerve impulse along axon.   (10)
   B. What is Synapse?   (6)

30

2054

Exam Code: 120602

Bachelor of Science (Bio-Technology)
Semester: II
Course Title: Genetics
Course Code: BBTL-2065
Session-2023-24

Time Allowed: 3 Hours

Max Marks:80

Note: Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 16 marks.

Section-A

1. State Law of segregation and Law of independent assortment. Explain them with crosses.

2. What is epistasis? Explain the following:

    (i)   Supplementary genes   4

    (ii)   Duplicate genes   4

    (iii) Inhibitory genes   4

    (iv)   Complementary genes.   4

Section-B

3. Define linkage and linkage groups. What are types of linkage? Explain chromosomal theory of linkage.

4. What is crossing over? List factors affecting crossing over. Explain in detail.

Section-C

5. What are mutations? Discuss types of mutations. Explain molecular mechanism of mutations.

6. Define bacterial genetics. Discuss conjugation in detail.

Section-D

7. Explain the following in detail:

    (i)   Centromere and telomere   8

    (ii)   Euchromatin and heterochromatin   8

8. What is population genetics? Write assumptions of Hardy Weinberg law.

Exam Code: 120602   Paper Code: 2201

Bachelor of Science (Bio-Technology) Semester: II

Course Title: Biochemistry-II

Course Code: BBTL-2086

Time Allowed: 3 Hours   Max Marks: 80

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 16 marks.

Section-A

1. What are the laws of thermodynamics? Discuss the concept of entropy in detail.
2. What is Inter organ Metabolism? Explain Compartmentation of Metabolism in detail along with Characteristics of metabolic pathways.

Section-B

3. How does ATP serve as a universal energy currency in cells? What role does ATP play in cellular metabolism?
4. Write a note on following:
   a. Biological Oxidation reduction reaction
   b. Energy Rich Metabolites
   c. Energy Coupling with ATP (NDP kinase)
   d. Structure of ATP

Section-C

5. What are enzymes? Write a note on their nomenclature and role in biological systems. List the factors which can affect enzyme activity.
6. Write a note on following:
   a.   Acid Base Catalysis   b. Covalent Catalysis.

Section-D

7. Derive the Michaelis-Menten equation its Significance. What are some assumptions made in the derivation of the Michaelis-Menten equation?
8. Write a note on following:
   a. Michaelis constant (Km)   b. Vmax
   c. Relationship between Km and Vmax   d. Isozymes

Programme: Bachelor of Science (Bio-Technology) Semester- II

Course Title: General Microbiology – II

Course Code: BBTL-2347

Time Allowed: 3 Hours   **Max. Marks: 80**

Note: Attempt five questions in all, selecting atleast one question from each section (A to D). Fifth question can be attempted from any section. Each question carries 16 marks. Draw diagrams wherever necessary.

Section A

Q1	a.	Explain how does temperature impact microbial growth, and what are the temperature preferences of different microbial groups?	8
	b.	What do you mean by monoauxic and diauxic growth of microorganisms	8
Q2	a.	Discuss how microbial growth occurs in a continuous system. Discuss the steady-state conditions achieved in continuous cultures.	8
	b.	Explain the following terms in relation to bacterial growth: generation time, doubling time, specific growth rate	8

Section B

Q3	a.	Define viruses and describe their basic structure. Explain why viruses are considered obligate intracellular parasites	8
	b.	Describe the methods used for the cultivation of plant viruses in laboratory settings.	8
Q 4	a.	Briefly discuss the different steps involved in life cycle of a Herpes simplex virus.	8
	b.	Compare and contrast the lytic and lysogenic cycles of bacteriophages.	8

Section C

Q5	a	Describe the mechanism of action of the influenza virus and discuss methods for its diagnosis and treatment.	8
	b	Describe the nonspecific defense mechanisms employed by the human body against microorganisms.	8
Q6	a	Discuss the pathogenesis, clinical features, diagnostic methods, and treatment options for bacterial disease tuberculosis.	8
	b	Write a note on fungal disease, Candidiasis.	8

Section D

Q7.	a	Discuss the essential role of microbes in the environment.	8
	b	Explain how genetically engineered microbes can be used to solve environmental problems.	8
Q8	a	What is the process of bio-mining, and how do microbes contribute to it?	8
	b	Describe the microbial processes involved in wastewater treatment for organic pollutant degradation.	8