Chattogram Veterinary and Animal Sciences University
Faculty of Food Science & Technology
BFST 1st year 2nd Semester Final Examination, 2023
Course Title: Physics-II (Theory)
Course Code: 0533PHC-102(T)

Full Marks: 70 **Time: 3 Hours**

(Figures in the right margin indicate full marks. Answer **four (4)** questions from each section where question number **1 and 6** are compulsory. Use separate answer scripts for each section. Fractions of the questions must be answered together.)

SECTION-A

1. a) Define radioactivity. 1
   b) Draw and explain the *V-I* characteristics curve of a *pn* junction diode. 2
   c) Connect a transistor in a circuit in common base configuration. 2

2. a) Write the postulates of special theory of relativity. How does global positioning system (GPS) rely on special theory of relativity? 3
   b) Derive Lorentz transformation equations by taking relativity into account and hence, show that Galilean transformation equations are special case of Lorentz transformation equations. 7

3. a) Discuss interference of light analytically and obtain the conditions of maximum and minimum intensities in the energy distribution graph. 7
   b) In Young's double slit experiment, the separation of the slits is 1.9 mm and the fringe spacing is 0.25 mm at a distance of 1 m from the slits. Calculate the wavelength of light. 3

4. a) Define electric charge and electric potential of a charged particle. Make a comparative study between Coulomb's electrostatic force and Newton's gravitational force. Measure the strength of the forces by considering the distance between electron and proton in an atom as 5.3×10^{-11} m. 5
   b) What is drift speed? Derive an expression for the drift speed of electrons in a conductor. 3
   c) A positive charge of $q_1 = 6 \times 10^{-7}$ C is placed at a distance of 0.5 m from another positive charge of $q_2 = 2 \times 10^{-7}$ C. At what point on the joining line, the electric field strength will be zero? 2

5. a) State Einstein's photoelectric equation and explain the significance of work function. 3
   b) Derive radioactive decay law and explain the concept of half-life. 5
   c) Calculate the stopping potential for a metal if the threshold frequency is 6×10^{14} Hz and the incident light has a frequency of 7×10^{14} Hz. 2

SECTION-B

6. a) Differentiate between self-inductance and mutual-inductance. 2
   b) Derive an expression for current in a *LR* series circuit. 3

7. a) Distinguish among conductor, semiconductor and insulator with the help of energy band diagram. 3
   b) What do you mean by hole current? Explain the formation mechanism of depletion region in a *pn* junction diode. 5
   c) "A *pn* junction diode can work as a rectifier" – explain. 2

8. a) Derive the mass-energy equivalence relation, $E = mc^2$, Where the symbols have their usual meanings. 5
   b) Show that length has relativistic effect and the relativistic length is shorter than the length measured at rest. 3
   c) A particle of mass 10^{-24} kg is moving with a speed of $\frac{2}{7} \times 10^8$ m/s. Calculate its mass when it is in motion. 2

9. a) Differentiate among paramagnetic, diamagnetic and ferromagnetic materials with examples. 3
   b) Explain domain theory and hysteresis in ferromagnetism. Why are ferromagnetic materials used in electromagnets and transformers? 5
   c) Define an *LR* circuit. How does it differ from an *RC* circuit. 2

10. a) Write short notes on (*i*) nuclear fission (*ii*) nuclear fusion. 2
    b) Establish a relationship between half life and decay constant for radioactive elements. The half-life of a radioactive substance is 30 days. Calculate (*i*) decay constant (*ii*) time taken for ¾ of the original number of atoms to disintegrate. 4
    c) Show that for two reflected rays to form Newton's rings, the apparent path difference between the rays should be, $x = 2\mu d \cos r$, Where the symbols have their usual meanings. 4

Chattogram Veterinary and Animal Sciences University
Faculty of Food Science & Technology
BFST 1st year 2nd Semester Final Examination, 2023
Course Title: Introductory Computer science (Theory)
Course Code: 0613-ICS-102(T)

Full Marks: 70 **Time: 3 Hours**

(Figures in the right margin indicate full marks. Answer any five (5) questions from each section. Use separate answer scripts for each section. Fractions of the questions must be answered together.)

SECTION-A

1. a) Define computer systems. What are the key differences between 1st and 4th generation computers. 3
   b) Write short notes on the following terms: $1 \times 4 = 4$
   (*i*) Memory (*ii*) Hardware (*iii*) Software (*iv*) CPU

2. a) Identify two RAM technologies commonly used in PCs. Explain the components of the CPU and analyze their working procedures. 3.5
   b) Describe the functions of a keyboard and mouse. Illustrate the working procedure of a keyboard. Explain five specific techniques for using a mouse. 3.5

3. a) Describe the different types of hardware components in a computer system. 2
   b) Compute the following binary operations: $2.5 + 2.5 = 5$
   (i) Add $(1111101.1110)_2$ and $(1001010.1010)_2$
   (ii) Substract $(10101011.101)_2$ from $(11111010.110)_2$

4. a) Convert the following numbers: $1 \times 3 = 3$
   (i) Transform $(P5M9.8F2)_{16}$ into its octal equivalent.
   (ii) Convert $(713364522)_8$ into its decimal equivalent.
   (iii) Transform $(11101010101101.10)_2$ into its hexadecimal equivalent.
   b) Apply the following bitwise operations to the decimal numbers P = −73 and Q = −58: $1 \times 4 = 4$
   (i) Bitwise OR.
   (ii) Bitwise AND.
   (iii) Bitwise NOR.
   (iv) Bitwise EX-OR.

5. a) Perform the bitwise EX-NOR operation on A = 32 and B= − 44. Draw the timing diagram for A, B and the result. 3
   b) Design a diagram and construct a truth table for the following: $2 + 2 = 4$
   (i) XOR gate using only NOR gates.
   (ii) XOR gate using only NAND gates.

6. a) Compare compilers and interpreters. Discuss two major types of programming languages, highlighting their advantages and disadvantages. 3
   b) Justify using appropriate diagrams and truth tables, "NAND gate can be constructed using NOR gates and vice versa". 4

SECTION-B

7. a) Draw a flowchart and write an algorithm to compute the values of the following series up to 70: 4

$7 \times 1 = 7$

$7 \times 7 = 49$

$7 \times 49 = 343$

… (and so on).

b) Design flowcharts for the following: 3

(i) Input three values, determine the largest value, and print the largest value.

(ii) Read a variable num 1 = 7 and store its negative value in another variable num 2.

(iii) Compute the area of a circle with radius *R*.

8. a) Explain the five components of data communication with appropriate diagrams. Describe the different types of data flow directions during communication between two devices. 3

b) Summarize the mesh, star, bus, and ring network topologies. Include their descriptions, diagrams, advantages and disadvantages. 4

9. a) Compare WAN, MAN, LAN and PAN network categories in terms of their characteristics. 3

b) Illustrate the most important criteria for a network. List and describe the possible types of network connections. 4

10. a) Define multiprogramming and multiprocessing. Explain their working procedures in detail. 3

b) Describe the goals and functions of an operating system. Justify the statement: "An operating system functions as a resource manager." 4

11. a) Illustrate the following types of data processing with their definitions, features and examples: $1 \times 4 = 4$

(i) Batch Processing

(ii) Online Processing

(iii) Real-Time Processing

(iv) Distributed Processing

b) Evaluate DBMS with real-world examples. Write the key functions of a DBMS. 3

12. a) What is a topology? Write a short description of the terms below: $1 + 4 = 5$

(*i*) Data (*ii*) Client (*iii*) Server (*iv*) Peer

b) Define the following terms: 2

(*i*) WWW (*ii*) WAP (*iii*) E-commerce (*iv*) Internet

Faculty of Food Science and Technology
BFST 1st Year 2nd Semester Final Examination, 2023
Course Title: Fundamentals of Food Engineering (Theory)
Course Code: 0721-FFE-102 (T)

Full Marks: 70 **Time: 3 Hours**

(Figures in the right margin indicate full marks. Answer **Four (4)** questions from each section, where question No. **1** and **6** are compulsory. Use separate answer script for each section. Split answers are strongly discouraged.)

SECTION-A

1.		How would you distinguish the core principles that define science, engineering, and technology?	5
2.	a.	What role does food microbiology play in the field of food science, and how does it contribute to the safety and quality of food products?	3
	b.	How do food scientists contribute to the development and innovation of the food industry?	3
	c.	What are the primary causes of food spoilage, and how do they contribute to the deterioration of food quality?	4
3.	a.	In what ways do food loss and waste arise during the processing and distribution stages of the food supply chain?	5
	b.	Outline potential strategies for minimizing food loss and waste.	5
4.	a.	Briefly describe the different modes of heat transfer.	5
	b.	Explain the influence of the physical properties of food raw materials on conversion operations and their effect on processing efficiency.	5
5.	a.	Provide an overview of electrostatic cleaning, radioisotope separation, and X-ray separation as methods for dry cleaning.	4
	b.	What do you mean by food rheology? Describe important rheological parameters for processing of food products	1+5=6

SECTION-B

6.		What is blanching? Why is it carried out before freezing, canning, and in some cases of drying?	2+3=5
7.	a.	Identify the primary sorting techniques used in the food industry to maintain product quality and safety.	5
	b.	Differentiate between sorting and grading. Discuss the criteria and techniques used in grading processes.	5
8.	a.	Clarify the primary function of emulsifying agents in food products. Explain how emulsifying agents facilitate the formation and stabilization of emulsions.	2+3=5
	b.	Distinguish between microfiltration and ultrafiltration in food processing, focusing on their pore size and specific applications.	5
9.	a.	What are extraction and expression? Describe the role of extraction in the decaffeination process of coffee and tea.	2+3=5
	b.	What is supersaturation, and how is it achieved by a crystallizer in food processing? Provide a concise overview of waste disposal practices in the food industry.	2+3=5
10.		Explain the calorific value of food and its significance in nutrition. Describe heat processing operations and the methods used to apply heat to food. Define aseptic canning and list the steps involved in in-pack sterilization.	2+3=5 5

Chattogram Veterinary and Animal Sciences University
Faculty of Food Science & Technology
BFST 1st year 2nd Semester Final Examination, 2023
Course Title: Physical Chemistry (Theory)
Course Code: 0531-PCM-102(T)

Full Marks: 70 **Time: 3 Hours**

(Figures in the right margin indicate full marks. Answer four (4) questions from each section where question number 1 and 6 are compulsory. Use separate answer script for each section. Split answers are strongly discouraged.)

SECTION-A

1.	a)	What is the law of mass action and its application?	3
	b)	Why is Gibbs free energy zero? State the equation.	2
2.	a)	Explain the statement "Equilibrium can be initiated from the either side".	4
	b)	Is there any difference between homogeneous and heterogeneous equilibrium in terms of reaction benefits?	6
3.	a)	What is a colligative property of solution? Recall the conditions those need to be fulfilled by solution to exhibit colligative properties.	3
	b)	State Raoult's laws of boiling point elevation.	2
	c)	For a solution of unit molality prove that $\Delta T_b=K_b$, where, ΔT_b = Elevation of boiling point and K_b= molal boiling point elevation constant.	5
4.	a)	What is sols? Differentiate between lyophilic and lyophobic sols.	3.5
	b)	"Sols exhibit Tyndall effect"- Justify the statement.	2.5
	c)	How will you prepare emulsion? Discuss types of emulsion and role of emulsifier in emulsion preparation.	4
5.	a)	Define reaction rate. Why high molecularity reactions are rare?	3
	b)	Prove that "Half-life of a first order reaction is independent of the initial concentration".	3
	c)	Recall the terms order of a reaction. 50% of a first order reaction is completed in 23 minutes. Calculate the time required to complete 90% of the reaction.	4

SECTION-B

6.	a)	"Ionic equilibrium is a chemical equilibrium"- Justify the statement.	3
	b)	Define buffer solution.	2
7.	a)	How do you make buffer solution? Can pH of a buffer solution be either less than or higher than 7.0?	4+2
	b)	What is electrolyte? Explain different types of electrolytes.	2+2
8.	a)	Illustrate factors affecting to degree of ionization.	3
	b)	Review Ostwald's dilution law. Recognize it's limitations.	4
	c)	The concentration of H+ ions in 0.01 M solution of a weak acid is 1.0×10^{-5} $molL^{-1}$. Calculate the dissociation constant of the acid.	3
9.	a)	Illustrate activation energy and enthalpy.	2.5+2.5
	b)	How does chemical reaction depend on activation energy?	5
10.		Write short notes on the following- i) Collision theory of reaction rate ii) Purification of sols iii) Solubility product	3+4+3

BFST 1st Year 2nd Semester Final Examination-2023

Course Title: Biochemistry (Theory)

Course Code: 0512-BCM-102 (T)

Full Marks: 70, Time: 3 Hours

(Figures in the right margin indicate full marks. Answer Three (3) questions from each section, where question No. 1 and 5 are compulsory. Use separate answer script for each section. Split answers are strongly discouraged.)

SECTION-A

1. a) Enumerate the organization of life. Discuss the role of Friedrich Wohler in the development of Biochemistry. 1+2=3
   b) Draw and level a cell. Show the macromolecules focused in a cell and the building block of which these are composed. 1+3=4
   c) Write down the structure of the following sugars: 1x4=4
   i) Glyceraldehyde ii) Fructose iii) Ribose iv) Hyaluronic acid

2. a) "Lipids are organic compounds originated from living beings"- justify. 4
   b) What are fatty acids? Differentiate between saturated, unsaturated and trans-fatty acids. 1+3=4
   c) Discuss the process of beta-oxidation of fatty acids and its role in energy production. 4

3. a) Enumerate the indispensible amino acids and fatty acids required for an adult. 2x2=4
   b) Discuss the urea cycle and its role in nitrogen metabolism. 4
   c) Classify amino acids based on their structure and mention special group present in each amino acids. 4

4. a) What is the central dogma of molecular biology? Distinguish between nucleotides and nucleosides. 1+3=4
   b) Describe the role of DNA and its role in protein synthesis. 4
   c) Discuss the role of RNA in gene expression. 4

SECTION-B

5. a) Define biocatalyst. Classify the enzymes with examples. 1+3=4
   b) Enlist factors associated with the enzyme action. Briefly describe two most important factors. 2+2=4
   c) What is the significance of Km value? 3

6. a) Define metabolism. Schematically show the gluconeogenesis pathway. 1+3=4
   b) Define the following terms: 1x4=4
   i) HMP shunt pathway ii) Beta-oxidation iii) Transamination iv) Co-enzyme
   c) What is PDH? Why TCA cycle is called amphibolic cycle? Explain. 1+3=4

7. a) Draw the structure of the following peptide: M-A-K-Y-S-D 4
   b) Write down the important functions of six (6) non-protein amino acids. 4
   c) Define reducing sugar. Why sucrose is called invert sugar? 1+3=4

8. a) Write down the structure of triacylglycerol. Briefly describe the factors affecting rancidity and lipid peroxidation. 1+3=4
   b) Define lipoprotein with their functions. 4
   c) What is steroid? Distinguish between cholesterol and ergosterol. 1+3=4

Chattogram Veterinary and Animal Sciences University
Faculty of Food Science & Technology
BFST 1st year 2nd Semester Final Examination, 2023
Course Title: Mathematics-II (Theory)
Course Code: 0541-MTH-102(T)

Full Marks: 70 **Time: 3 Hours**

(Figures in the right margin indicate full marks. Answer any **five (5)** questions from each section. Use separate answer scripts for each section. Fractions of the questions must be answered together.)

SECTION-A

1. a) For what value of λ, the vector $2\hat{\imath} - \hat{\jmath} + 2\hat{k}$ and $3\hat{\imath} + 2\lambda\hat{\jmath}$ will be perpendicular? 3
   b) Find the directional derivative of the function $f(x) = x^2 - y^2 + 2z^2$ at the point P (1, 2, 3) in the direction of the line PQ where Q is the point (5, 0, 4). 4

2. a) Find the projection of $\vec{A}$ on $\vec{B}$, where $\vec{A} = 2\hat{\imath} - \hat{\jmath} + \hat{k}$ and $\vec{B} = 5\hat{\imath} - 2\hat{\jmath} + 3\hat{k}$. Find also the angle between these vectors. 3
   b) If a vector field is given by $\vec{F} = (x^2 - y^2 - x)\hat{\imath} - (2xy + y)\hat{\jmath}$. Is this field irrotational and solenoidal? If so, find its scalar potential 4

3. a) Mention the Euler's integral for a Fourier series. 2
   b) A periodic function $f(t)$ with period 2π is defined within the period $(-\pi < t < \pi)$ by 5

$$f(t) = \begin{cases} -1, & -\pi < t < 0 \\ 1, & 0 < t < \pi \end{cases}$$

   Find its Fourier series expansion.

4. a) Obtain the differential equation of which $y^2 = 4a\,(x + a)$ is a solution. 3
   b) Solve the following homogenous differential equations: $\frac{dy}{dx} = \frac{y - x + 1}{y + x + 5}$ 4

5. a) Verify that y is a solution of the ordinary differential equation: 3
   $y' + 4y = 1.4,\ y = ce^{-4x} + 0.35,\ y\,(0) = 2$
   b) Determine the particular solution of the initial value problem (IVP) in 5(a). Hence, draw a graph for the solution of the IVP. 2 + 2 =4

6. a) Solve the following Bernoulli's differential equation $\frac{dy}{dx} = y\tan x - y^2 \sec x$. 4
   b) In a bacterial culture where the growth rate depends on the current population size, if the population increases two-fold in one hour, how long will it take for the population to increase threefold? 3

SECTION-B

7. a) An approximate value of e is given by $X_1 = 2.7182818$ and its true value is $X = 2.718281828459045$. Find the absolute and relative errors. Find the absolute and relative errors. 2

   b) Imagine you're managing a construction project and need to balance costs and resources by the following equations: 5

$$10x + y + z = 12$$
$$2x + 10y + z = 13$$
$$x + y + 5z = 7$$

   Using the Gauss-Jordan method, find the exact quantities of concrete (x), steel (y), and glass (z) to meet all constraints simultaneously.

8. a) Define interpolation and truncation error with examples. 2

b) The population of a town in the decennial census was a s given below. Estimate the population for the year 2018. 5

Year (x)	1981	1991	2001	2011	2021
Population (y) **In thousand**	46	66	81	93	101

Explain why Newton's backward formula will be most acceptable for finding the value for the year 2018.

9. a) Find the first derivative of the function tabulated below at $x = 0.6$ 3

x	0.4	0.5	0.6	0.7	0.8
y	1.5836	1.7974	2.0442	2.3275	2.6511

b) Suppose you are studying on the growth of a bacterial colony under specific conditions. The data collected over time shows the population $f(x)$ of the colony (in thousands) at different time points x (in hours): 4

x	0	1	2	3	4
$f(x)$	3	6	11	18	27

i. Use Lagrange's interpolation formula to determine the function $f(x)$, which models the bacterial growth.

ii. Use the derived function $f(x)$ to estimate the population at x=5hours.

10. a) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using Simpson's 3/8 rule. Then compare and justify the results with exact solution. 3

b) Use Picard's method to approximate the value of y when $x = 0.2$, given that $y = 1$, when $x = 0$ and $\frac{dy}{dx} = x - y$ 4

11. a) Write down the formula of Runge-Kutta method of second and third order. 2

b) Using Runge-Kutta method of fourth order, solve for y (0.4) considering $h = 0.2$. 5

Given that $\frac{dy}{dx} = xy + x^2$, $y(0) = 1$.

12. a) Find the positive root of $x = \cos x$ using Newton-Raphson method up to four decimal point. 3

b) Given the following set of points: 4

x	1	3	4	6
y	−3	9	30	132

Obtain the value of y when $x = 2$ using Newton's divided difference formula.