

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st Year 2nd Semester Final Examination, 2016
Subject: Mathematics-II
Course Code: 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 script for each section. Split answer is discouraged.)

Section-A

1. a) Define order and degree of a differential equation. Give an example of each of the following type of differential equations. 4
 - i) A linear differential equation of second order and 1st degree
 - ii) A non-linear differential equation of second order and second degree
 - iii) Second order and third degree
- b) What do you understand by integrating factor? Solve the following linear differential equation 3

$$\frac{dy}{dx} + 2y \tan x = \sin x; \quad y\left(\frac{\pi}{3}\right) = 0$$
2. a) Write down the working rules for an exact differential equation. Check whether the following differential equation is exact or not. If yes solve it. 5

$$(y^2 e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$$
- b) Construct the differential equation for which $y^2 = 4a(x+a)$ is a solution. 2
3. a) Define the orthogonal trajectories of a family of curves. 1
- b) Solve the following higher order differential equation (any two) 6
 - i) $(D^2 + 2D + 1)y = x^2 + 2x$
 - ii) $(D^2 + D - 2)y = 2x - 40 \cos 2x$
 - iii) $(D^2 - 4D + 4)y = x^3 e^{2x}$
 - iv) $(D^2 - 2D + 1)y = xe^x \sin x$
4. a) In a Bacterial culture the rate of growth is proportional to the number of bacteria present at time t. If the number of Bacteria is doubled after 4 hours, find the number after 12 hours. If after 3 hours number is 10^4 and 5 hours is 4×10^4 then find the initial number of Bacteria. 4
- b) A tank is initially filled with 100 gal of salt solution containing 1 lb of salt per gallon. Fresh brine containing 2 lb of salt per gallon pumps into the tank at the rate of 5 gal/ min, and the mixture, assumed to be kept uniform by stirring, runs out at the same rate. Find the amount of salt in the tank at any time t, and determine how long it will take for this amount to reach 150 lb. 3
5. a) Define scalar triple product of vector. Find the volume of the parallelepiped whose edges are represented by $\vec{A} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{B} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{C} = 3\hat{i} - \hat{j} + 2\hat{k}$. 4
- b) Give the physical significance of $\text{grad } \phi$. Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at $(2, -1, 2)$ in the direction $2\hat{i} - 3\hat{j} + 6\hat{k}$. 3
6. a) Evaluate $\iint_S (3x\hat{i} + 2y\hat{j}) \cdot d\vec{A}$ where S is the sphere $x^2 + y^2 + z^2 = 9$. 3
- b) If $\vec{A} = (3x^2 + 6y)\hat{i} - 14yz\hat{j} + 20xz^2\hat{k}$ evaluate $\int_C \vec{A} \cdot d\vec{r}$ from $(0, 0, 0)$ to $(1, 1, 1)$ 4
along the path $x = t, y = t^2, z = t^3$.

Section-B

7. a) What do you understand by 'Error' in numerical Analysis? Discuss different types of errors in numerical computation. 3

b) Find the relative error for $X_T = e$ and $X_A = \frac{19}{7}$ 1

c) Show that the equation $x^3 + 3x^2 - 5x - 3 = 0$ has 3 roots. Find the intervals of which the roots exist. 3

8. a) Find a positive root of the equation $x^3 + 18x^2 - 51 = 0$ by an appropriate numerical method. How many steps does it take to 4 place accuracy? 3

b) Define Forward difference. Estimate the missing term in the following table 4

x:	0	1	2	3	4
f(x):	1	3	9	?	81

9. a) By means of Newton's divided difference formula find the values of f(8) and f(15) from the following table 5

x:	4	5	7	10	11	13
f(x):	48	100	294	900	1210	2028

b) Prove that $f(4) = f(3) + \Delta f(2) + \Delta^2 f(1) + \Delta^3 f(1)$ 2

10. a) Write down the geometrical interpretation of Trapezoidal rule. 3

b) The velocities of a car (running on a straight road) at intervals of 2 minutes are given below: 4

Time in minutes	0	2	4	6	8	10	12
Velocities in km/hr	0	22	30	27	18	7	0

Apply Simpson's rule to find the distance covered by the car.

11. a) Define periodic function, even function and odd function with example. 3

b) Find the Fourier series expansion of the function f(x) of period 2π , where 4

$$f(x) = x^2 \quad ; \quad -\pi \leq x \leq \pi$$

Hence find the sum of the series

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$

12. a) Define Fourier Sine series and Cosine series. Expand 7

$$f(x) = \frac{1}{4} - x \quad \text{if } 0 < x < \frac{1}{2}$$

$$= x - \frac{3}{4} \quad \text{if } \frac{1}{2} < x < 1$$

as the Fourier series of Sine terms.

Subject: Physics-II
Course Code: PHC-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 answer is discouraged.)

Section-A

1. a) Define atomic current, magnetic susceptibility and curie temperature. 2
b) State the superposition principle. What is the importance of this principle? 3
2. a) State Faraday's law of electromagnetic induction. Hence show that 6
$$\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$$
 where the symbols have their usual meanings.
b) Write down the relation between i) electric field and potential ii) Current and current density. 4
3. a) Define electron drift velocity. Derive an expression for electron drift velocity. 4
b) Obtain an expression for the growth of both charge and current in a capacitor through a resistance with the help of diagram. 6
4. a) State the postulates of Bohr atom model. 2
b) Obtain an expression for the total energy of an electron in the stationary orbit. 5
c) Calculate i) the wave number ii) the wave length and iii) the frequency of the H_α line of Hydrogen. Assume Rydberg constant $R = 1.09 \times 10^7 m^{-1}$ 3
5. a) How could you differ para-magnetism from ferromagnetism and Anti-ferromagnetism? 3
b) State Lenz's law. Deduce a mathematical expression for self-inductance of a solenoid. 5
c) A solenoid having an air core and 10 cm long has 100 turns and its area of cross section is 5 cm^2 . Find the coefficient of self-inductance of the solenoid. 2

Section-B

6. a) Write down the unit of radioactivity. Define threshold frequency. 2
b) Explain Fission and fusion process. 3
7. a) Explain "Time dilation" and "length contraction". 4
b) Establish the Einstein mass-energy relation $E = mc^2$. 4
c) The mass of a particle is triple of its rest mass. What is its speed? 2
8. a) Define half-life of radioactive substance. Deduce an expression for decay law of radioactive elements. 4
b) If the half-life of radioactive elements is 100 days, find in what time its initial amount gets reduced to $\frac{1}{10}$ th amount. 2
c) Show the circuit diagram of forward and reverse biasing of a p-n junction 2
d) State Kirchhoff's laws of electricity. 2
9. a) Draw the I-V characteristics curve and also draw the symbols of diode, npn and pnp transistor. 2
b) Explain diode acts as a rectifier. 3
c) Define majority carrier. Explain the working principle of npn transistor with the help of circuit diagram. 5
10. a) State the postulates of special theory of relativity. 2
b) Define inertial frame. Show that for relativity $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ where the symbols have their usual meanings. 5
c) Show by direct application of Lorentz transformation $x^2 + y^2 + z^2 - c^2 t^2$ is invariant. 3

Faculty of Food Science and Technology
BFST 1st Year 2nd Semester Final Examination, 2016
Subject: Introductory Computer Science
Course Code: ICS-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 answer is discouraged.)

Section-A

1. a) What is the difference between bit and byte? Why binary system is used in a digital computer? 2
- b) Convert the following by showing your conversion steps clearly- 3
 - i) $(2016)_{10}$ to binary
 - ii) $(10110001101011)_2$ to decimal
 - iii) $(AB2CD)_{16}$ to decimal
2. a) What do you mean by data and information? Briefly explain how ALU process data to information. 6
- b) Briefly explain the working mechanism of a cache memory. 4
3. a) How does the operating system communicate with CPU? Write down at least 3 operating systems that are most widely used in today. 4
- b) What is the difference between RAM and ROM? 3
- c) What are the criteria you should evaluate before buying a printer? 3
4. a) What is the difference between storage and memory? 2
- b) Draw a general block diagram of a computer system and explain its each component. 4
- c) Identify the input and output devices from the following: 4
 - i) CDROM
 - ii) Projector
 - iii) Joy Stick
 - iv) Mouse
 - v) Printers
 - vi) Keyboard
 - vii) Scanner
 - viii) OCR
 - ix) Microphone
 - x) Oscilloscope
5. a) What do you mean by computer network? Briefly explain the characteristics of any two types of computer network. 6
- b) Briefly explain network media with proper example. 4

Section-B

6. a) Perform subtraction of the following binary number using 2's complement 2
$$11110000_2 - 1111_2$$
- b) Write down the differences between software and firmware. 3
7. a) What is the basic difference between compiler and Interpreter? Enlist at least two compiler and interpreter. 3
- b) What is multimedia means? Enlist the four multimedia softwares. 3
- c) Elaborate the following terms- 4
 - i) WWW
 - ii) HTTP
 - iii) HTML
 - iv) DNS
 - v) WAP
 - vi) URL
 - vii) SMTP
 - viii) ISDN
8. a) Define the following type of text codes: i) ASCII ii) Unicode iii) EBCDIC 6
- b) Write down the major distinction between primary memory and secondary memory. 4
9. a) What is computer virus? How a virus affected the computer performance? How can you secure your computer from virus attack? 4
- b) What is the difference between LAN, MAN and WAN? 3
- c) What is Internet? State the basic features of TCP/IP protocol. 3
10. a) What do you mean by programming language? Write down the differences between high level and low level languages. 4
- b) Draw a truth table and logic gate of the following types of operators. 6
 - i) AND operator
 - ii) OR operator

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 2nd Semester Final Examination 2016
Subject: Fundamentals of Food Engineering (Theory)
Course Code: FFE-102

Full Marks: 70

Time: 3 hours

(Figures in the right margin indicate full marks. Answer any four (4) questions from each section where question no. 1 and 6 are compulsory. Use separate answer script for each section. Split answer is not allowed.)

Section-A

1. Define food science and technology. Briefly describe the fields of activities of you as a student of food science and technology? 5
2. a) Explain the degree of perishability of natural foods. Describe the principles and methods of food preservation. 6
b) Give the functional classification of foods. Discuss the flavor characteristics of food. 4
3. a) Briefly describe the modes of heat transfer in canned food. Discuss the factors affecting heat penetration in canned foods. 5
b) Define retort. What are the differences between batch and continuous type retorts. Write down the features of tin plate containers. 5
4. a) Give an overview of double seam formation. 4
b) Briefly describe the spoilage of canned food with preventive measures. 6
5. a) Illustrate decimal reduction time and thermal death time. Discuss the canning of fish. 5
b) Define boiler. Classify boilers on the basis of different characteristics. 5

Section-B

6. Define food engineering operation. Give an overview of food engineering operation. 5
7. a) Briefly describe the extraction process. What factors affect the rate of extraction? 6
b) Explain the uses of distillation in food processing. Differentiate between steam distillation and fractional distillation. 4
8. a) What do you mean by process suitability? How size and shape of the raw material is affecting the process of suitability? 5
b) Briefly describe the growth properties of the raw materials. 5
9. a) What are the disadvantages of wet cleaning? How can you increase the efficiency of soaking and spray washing? 5
b) Explain the importance of size sorting. Describe the fixed aperture screens. 5
10. a) Discuss the objectives and importance of size reduction. Write down the mechanisms of size reduction. 5
b) Write short notes on: (any two) 2.5x2=5
i) Blanching, ii) Pasteurization, iii) Casehardening.

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Section-A

1. a) What are colloids? 2
b) Discuss about the types of colloidal systems. 3
2. a) Explain the law of mass action. 2
b) Derive the relation between K_P and K_C . 4
c) At 500° C, the reaction between N_2 and H_2 to form ammonia has $K_C = 6.0 \times 10^{-2}$. What is the value of K_P for the reaction? 4
3. a) How do you determine the molecular weight of a solute from elevation of boiling point? 4
b) State Raoult's law of lowering of vapour pressure. Under what condition is this law valid? 3
c) What will be the vapour pressure of a solution of KNO_3 containing 3 gm of KNO_3 /100 gm of water at 27° C? [Vapour pressure of water at 27° C is 26.7 mm Hg.] 3
4. a) What is buffer solution? Write down the mechanism of acidic and basic buffer solution. 5
b) Discuss in details about the Faraday's law of electrolysis. 5
5. a) What do you understand by the rate of a reaction? 4
b) Write the equation for the rate constant of a first order reaction and derive the expression for half-life. 4
c) 50% of a first order reaction is completed in 25 minutes. Calculate the time required to complete 90% of the reaction. 2

Section-B

6. a) Derive surface tension. What is the effect of temperature on surface tension? 3
b) What is common ion effect? 2
7. a) State and explain Hess's law. 3
b) For the decomposition reaction of HI to H_2 and I_2 , derive the equilibrium constant K_P as you want to get "x" moles of I_2 and H_2 with initial "a" moles of HI. 4
c) The partial pressure of CO_2 in the reaction: 3
$$CaCO_3 \rightleftharpoons CaO (s) + CO_2 (g)$$
 is 0.773 mm at 500° C.
Calculate K_P at 600° C for the above reaction where ΔH is Kcal/mole.
432 8
8. a) Calculate the molarity and normality of Na_2CO_3 solution if 20 gm of it is dissolved in 500 ml water. 4
b) Discuss in detail about "transition state theory". 6
9. a) Explain the differences between gel and emulsion. 3
b) Explain the term Zeta potential. 3
c) Write the application of colloids. 4
10. Write short notes on: 10
 - a) Reverse osmosis
 - b) Catalysis
 - c) Ostwald's law
 - d) Activity Co-efficient
 - e) Heat of reaction

Section-B

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as the Fourier series of Sine terms.

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b) Explain the term Zeta potential. 3
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10. Write short notes on: 10
 a) Reverse osmosis
 b) Catalysis
 c) Ostwald's law
 d) Activity Co-efficient
 e) Heat of reaction

Faculty of Food Science and Technology
BFST 1st year 2nd Semester Final Examination, 2016
Course Title: Biochemistry
Course Code: BCM-102

Full Marks: 70

Time: 3 hours

(Figures in the right margin indicate full marks. Answer any **three** questions from each section where question no. 1 & 5 are compulsory. Use separate answer script for each section. Split answer is discouraged.)

SECTION-A

1.
 - a) Define Biochemistry. Discuss the scope of Biochemistry and its relation with other sciences. 4
 - b) How is carbohydrate classified? Write down the rings structure of i) Methyl- α -D-glucopyranoside 3
ii) β -D-mannopyranoside.
 - c) Mention the source, repeating unit and linkage of the following carbohydrate : 2
i) Lactose ii) Glycogen iii) Pectin iv) Hyaluronic acid
 - d) How is carbohydrate identified? 2
2.
 - a) Define dispensible amino acid. Enlist some amino acids which are essential for infant. Write down the biomedical importance of protein. 3
 - b) Classify protein with examples on the basis of biological function. 3
 - c) Define denaturation of protein. Discuss the factors that are associated to protein denaturation. 3
 - d) Write down the structure of the following polypeptide chain "Val-Cys-Tyr-Gly" 3
3.
 - a) How is natural oil converted into artificial fat? Differentiate between fat and wax. 3
 - b) Define lipid. Write down the bloor classification of lipid with their respective examples. 3
 - c) Which test is used to detect the purity of fat? Why is oxidative rancidity more frequently occur in tallow than soyabean oil? 3
 - d) What is amphipathic lipid? Draw the structure of an animal sterol. Write down the importance of steroid molecule in human body. 3
4.
 - a) Distinguish between transamination and deamination with example. 2
 - b) Write down the clinical importance of urea cycle. 3
 - c) How will you calculate total number of ATP after complete oxidation of one mole myristic acid? 4
 - d) What is biogenic amine? Write down the reaction of pay-off phase in glycolysis. 3

SECTION-B

5.
 - a) Why is store glycogen act as fuel reserve in human body? Sketch the total procedure of glycogenolysis in hepatocyte. 4
 - b) "Krebs cycle is amphibolic in nature" justify this statement. 3
 - c) Enlist some locations in which PPP pathway occur. Give the reaction catalyzed by the following enzymes i) Hexokinase ii) Pyruvate dehydrogenase. 4
6.
 - a) Define biocatalyst. How will you prove "all enzymes are protein, but all proteins are not enzymes"? 3
 - b) Explain anaplerotic reaction with example. 3
 - c) What is K_m ? How will you calculate the value of K_m ? Write down the importance of it. 4
 - d) Write down the salient features of active site of an enzyme. 2
7.
 - a) What are nucleotides? Enumerate their functions. 3
 - b) Distinguish between DNA and RNA. 2
 - c) Write down the structure of the following bases of nucleic acid i) Adenine ii) Uracil iii) Guanine 3
 - d) Write down the salient features of DNA double helix with figure. Briefly describe about the Chargaff's rule. 4
8. Write down short notes on any three of the following: 4×3=12
 - a) Amino acid pool
 - b) Denaturation of DNA
 - c) Phospholipid
 - d) Knoop's experiment.

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Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 2nd Semester Final Examination, 2016
Subject: Inorganic Chemistry (Theory)
Course Code: ICM-102

Full Marks: 70

Time: 3 hours

(Figures in the right margin indicate full marks. Answer any four (04) questions from each section where question no. 1 and 6 are compulsory. Use separate answer scripts for each section. Split answers are not allowed.)

Section-A

1. Derive Henderson-Hasselbach equation of acidic buffer solution. 5

2.
 - a) What is indicator? 2
 - b) What is the pH of human saliva? $[\text{OH}^- = 4 \times 10^{-8} \text{ M}]$ 3
 - c) "Heat of neutralization is constant" Explain. 5

3.
 - a) How does oxidation number differs from valency? 3
 - b) Determine the oxidation number of- 4
 - i) Nitrogen in NH_2OH
 - ii) Sulphur in $\text{Na}_2\text{S}_4\text{O}_6$ and $(\text{NH}_4)_2\text{S}$
 - iii) Chromium in $\text{Cr}_2\text{O}_7^{2-}$
 - c) Balance and complete the following equation: 3
$$\text{Cr}_2\text{O}_7^{2-} + \text{I}^- + \text{-----} \longrightarrow \text{-----} + \text{I}_2 + \text{H}_2\text{O}$$

4.
 - a) Distinguish between ionic and covalent bonds. 4
 - b) Why are metals good conductors of heat and electricity? 3
 - c) What are the significances of hydrogen bonds? 3

5.
 - a) What is hydrogen bond? 2
 - b) Explain inter and intra molecular hydrogen bond. 2
 - c) Discuss co-ordination bond with examples. 3
 - d) Explain the term "Variable covalency". 3

Section-B

6. Justify the position of hydrogen in the periodic table. 5

7.
 - a) What are inert gases? Why are they so called? 2
 - b) Discuss the separation of inert gases from their mixture by Dewar's coconut charcoal method. 6
 - c) State the important uses of inert gases. 2

8.
 - a) What do you mean by fixation of nitrogen? Explain. 3
 - b) Describe the production process of soda ash by solvey process with a flow diagram. 7

9.
 - a) Write down some uses of sulfuric acid. 2
 - b) Give a brief account of different oxides of phosphorus, sulphur and nitrogen. 3
 - c) Write down the extraction process of Aluminium. 5

10. Explain the following with appropriate reasons 10
 - a) H_2O is liquid and H_2S is gas at room temperature.
 - b) Sodium is kept under kerosene.
 - c) NaCl is soluble in water but not in chloroform.
 - d) HF cannot be stored in glass bottles.