Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st Year 2nd Semester Final Examination, 2015
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. Given the following first order ordinary differential equations

   i) $y' = y^2 e^x$

   ii) $xsinydx + (x^2+1)cosydy = 0$

   iii) $(x+1)\frac{dy}{dx} - y = e^x(x+1)^2$

   iv) $(y^2 - x^2)dx + 2xydy = 0$

   a) Classify the above equations into the following categories. If an equation belongs to several different categories, put it into at least one category. 4
   - Separable equation
   - Exact equation
   - First order linear equations
   - None of the above

   b) Solve the 2nd equation (ii) with $y(1) = \frac{\pi}{2}$ 3

2. a) Write down the general form of 1st order linear differential equation and Bernoulli's differential equation. 2

   b) What do you mean by the orthogonal trajectories of a family of curves? Find the orthogonal trajectories of the family of circles which have centre at (0,0) and radius r. 5

3. a) Define homogeneous function with example. Check whether the following differential equation is homogenous or not. If yes solve it. 5

$$xdx + sin^2\left(\frac{x}{y}\right)[ydx - xdy] = 0$$

   b) Verify that $y(x) = 10 - ce^{-x}$ with c a constant is a solution of $y' + y = 10$. 2

4. a) Water at temperature 100°C cools in 10 minutes to 88°C in a room temperature 25° C. Find the temperature of water after 30 minutes. 4

   b) Solve the following higher order differential equation (any one) 3

   i) $(D^2 - 6D + 9)y = 6e^{3x} + 7e^{-2x} - log2$

   i) $(D^2 - 5D + 6)y = e^x cos2x$

5. a) Determine a unit vector perpendicular to the plane $\bar{P} = 2\hat{\imath} - 6\hat{\jmath} - 3\hat{k}$ *and* $\bar{Q} = 4\hat{\imath} + 3\hat{\jmath} - \hat{k}$ 3

   b) In what direction from the point (2, 1, -1) is the directional derivative of $\varphi = x^2yz^3$ a maximum? Also find the magnitude of this maximum. 4

6. a) Differentiate the gradient, divergence and curl of a function. Discuss along with their physical significance. 4

   b) If $\varphi = 2xz^4 - x^2y$ find $\nabla\varphi$ *and* $|\nabla\varphi|$ at point (2,-2,-1) 3

Section-B

7. a) Newton's method for finding a root of $f(x)=0$ is based on the fixed point iteration 3

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

Derive this formula from Taylor series expansion of $f(x)$

b) Use Newton's method to find a root of 4

$$x^4 - 2x^2 + x - 3 = 0$$

accurate to at least 4 significant figures starting with initial guess $x_0 = 2.0$

8. a) What do you mean by interpolation and extrapolation? 2

b) The population of a town in the decimal census was as given below: 5

Year x	1891	1901	1911	1921	1931
Population(in thousands)	46	66	81	93	101

Estimate the population for the year ~~1985~~ 1895 using appropriate interpolation formula.

9. a) Use suitable integration formula to approximate $\int_0^1 \frac{1}{3+x} dx$ with 4 strips and 8 strips respectively. Compute an error bound of your approximation 7

10. a) Show that divided differences are symmetrical in their arguments. 2

b) Given the set of tabulated points (1,-3), (3, 9), (4, 30), (6,132). Obtain the value of y when x=2 using Newton's divided difference formula. 5

11. a) Given that $f(x) = x + x^2$ for $-\pi < x < \pi$ find the Fourier expression of f(x). 7

Deduce that $\frac{\pi^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots\cdots\cdots\cdots$

12. a) Define Fourier series. Write some advantages of the Fourier series. 3

b) Obtain the Fourier cosine series of 4

$$f(x) = x^3 \text{ for } -\pi < x < \pi$$

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st Year 2nd Semester Final Examination, 2015
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) Convert to binary from $(678.50)_{10}$ 2.5
   b) Convert to decimal from $(ABCDE)_{16}$ 2.5

2. a) Define analog computer and digital computer. 2
   b) Explain the properties of the following types of computer: 8
      i) Workstation iii) Mainframe computer
      ii) Notebook computer iv) Super Computer

3. a) Define software. Briefly explain system software and application software with examples. 5

   b) Briefly explain the properties of GUI and CLI. 5

4. a) List the two main parts of the CPU and explain how they work together. 4

   b) Explain the difference between RAM and ROM. Show the memory hierarchy of a computer system. 6

5. a) Define computer virus. Write down some harmful effects of computer virus. 4
   b) State protocol. Define the following protocols: 5
      i) SMTP ii) DNS iii) FTP and iv) HTTP
   c) Give some examples of network medias. 1

Section-B

6. a) Perform the following binary operations: 3
      i) 1001011.11+101.01
      ii) 110010/110
   b) Calculate the 2's complement of the following binary numbers: 2
      i) 1010111 ii) 10011.11

7. a) What is operating system (OS)? Give some example. Describe operating system's role. 5

   b) Briefly describe multitasking and multiuser operating systems. 5

8. a) Briefly explain how data is stored on the surface of hard disk. 5
   b) Explain the working principles of cache memory during data processing. 5

9. a) What do mean by information? Explain the four phases of information processing cycle. 6
   b) Write down some major distinctions between storage and memory. 4

10. a) Distinguish between assembler and complier. Do you think Pascal is a high level programming language? Justify. 4
    b) What is debugger? Explain run time and compile time error in a programming language. 4
    c) Identify input and output devices from the following list: 2
    Modem, printer, Microphone, MICR, Mouse, OMR, Scanner, Sound box, Projector, Digitizer.

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 2nd Semester Final Examination, 2015
Subject: Inorganic Chemistry (Theory)
Course Code: ICM-102

Full Marks: 70 **Time: 3 hours**

(Figures in the right margin indicate full marks. Answer **4** questions from each section. 1 & 6 Questions are compulsory. Use separate answer script for each section. **Split answer is not allowed**.)

Section-A

1. a) What is pH? The pH of a solution of HCl is 2. Find out the amount of acid present in a liter of the solution. 3
   b) What are conjugated acid-base pairs? Give two examples. 2

2. a) Define the following terms: 3
      i) Oxidizing agent
      ii) Reducing agent
      iii) Equivalent weight
   b) Balance the following equation (Redox method) 3
      $Cr_2O_7^{2-} + Fe^{2+} + H^+ \longrightarrow Cr^{3+} + Fe^{3+} + H_2O$
   c) Give points of distinction between oxidation number and valency. 4

3. a) What is indicator? 2
   b) Derive Henderson-Hasselbach equation of acidic buffer solution. 5
   c) What is the pH of human saliva? [$OH^- = 4x10^{-8}$ M] 3

4. a) Write down the properties of covalent bond. 4
   b) Discuss the coordinate covalent bond with examples. 2
   c) Which factors are involved for the formation ionic bond? 4

5. a) What is hydrogen bond? 2
   b) Explain inter and intra molecular hydrogen bonding. 2
   c) Write down the significance of hydrogen bonds. 3
   d) Write down the differences between ionic and covalent bond. 3

Section-B

6. Draw a flow chart of isolation of inert gases by coconut charcoal method. 5

7. a) Write down some uses of Boric acid. 2
   b) Give a brief account of different oxides of phosphorus, sulfur and nitrogen. 3
   c) Write down the extraction process of Aluminium from alumina. 5

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

9. a) Write the uses of HF. 2
   b) What are the noble gases? Write the electronic configuration of Ar and Kr. 4
   c) Write the geometric structure of XeF_2 and XeF_4. Why He and Ne do not form such compounds? 4

10. a) Justify the position of alkaline earth metals in the periodic table. 3
    b) What are the important uses of hydrogen? 4
    c) KOH is stronger base than $Ba(OH)_2$. Explain why? 3

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 2nd Semester Final Examination, 2015
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 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) Destine Food Science. Explain why food technology and engineering is essential in food industry. 5

2. a) How spoilage of food may occur? Why commercial preservation of food is necessary? 4
   b) Narrate the effect of heat treatment on the composition and quality of foods. 6

3. a) Give an overview of a septic canning. 5
   b) Enumerate the characteristics of an ideal container. Illustrate the fabrication step of tin can? 5

4. a) What are the basic principles of the contract equilibrium process? Briefly describe the different extraction processes? 6
   b) Narrate gas absorption? Develop gas absorption equations for ideal and non-ideal gas? 4

5. a) Give short notes on: i) Colour and Weight sorting, ii) Hammer mill, iii) Homogenization, iv) Pasteurization. 2.5x4=10

Section -B

6. a) Briefly describe the factors affecting size reduction? 5

7. a) Illustrate general graphical method of calculating lethal rate using TDT curve. 6
   b) You are given a food with 10^6 heat resistant bacteria per gram for commercial sterilization in 250 gram can. If the retort contains 1000 cans, using 12-D heating concept, how many cans would be sterilization? 4

8. a) What do you know about blanching? Explain its method. 3
   b) Illustrate different types of distillation system with their use in the industry. 7

9. a) Briefly describe the functional properties of food raw materials. What principles are utilized during mechanical harvesting? 7
   b) To satisfy a cleaning process, What are the requirements you think? 3

10. a) Mention different cleaning methods? Illustrate aspiration cleaning system and Flat bed screening system? 6
    b) "Sorting plays an important part in controlling the effectiveness of many food processes"-Justify it? 4

Chittagong Veterinary and Animal Sciences University
Faculty of Food Science and Technology
BFST 1st year 2nd Semester Final Examination, 2015
Subject: Biochemistry (Theory)
Course Code: BCM 102

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 answer is discouraged.)

Section-A

1. a) Define biomolecules. Write down the differences among various biomolecules in term of definition, constituents, percentage and prime role in your body. 3
   b) Show the structure of table sugar, milk sugar and maltose. 3
   c) Give example of any one structural and storage polysaccharide with their structure. 3
   d) Define carbohydrate. Write the functions of carbohydrate. 2

2. a) Define amino acid and imino acid. Classify amino acid on the basis of their metabolic fate. 3
   b) What is zwitterion? How will you determine the amino acids sequence of a protein sample? 3
   c) Define essential amino acid. Show the structure of essential amino acids those are needed for adult human beings. 3
   d) Give the differences between α-helix and β-pleated structure. 3

3. a) "TCA cycle is an open cycle"-Justify this statement. 2
   b) Calculate the total number of ATP in anaerobic glycolysis. How human bodies utilize lactate? 4
   c) How can you get energy during starvation period? 3
   d) Show the activation step of β-oxidation. 3

4. a) What is rancidity? Mention the causes of rancidity of fat. Why vegetable oil is more stable than animal fat? 3
   b) Define lipoprotein. Why LDL is bad for human health? 3
   c) Give example of ω_3 and ω_6 fatty acids with their structure. Write the importance of these types of fatty acids in human health. 3
   d) Show the structure of any one glycolipid. How does glycolipid helps in brain development of young babies? 3

Section-B

5. a) How will you calculate the total number of ATP after complete oxidation of one mole valeric acid? 4
   b) Define biogenic amine. Why production of excess NH_3 is harmful for human body? 3
   c) Write down the irreversible steps of glycolysis. Draw the malate shuttle as a means of transfer of NADH from cytosol to mitochondria. 4

6. a) Write down the modern classification of enzyme. 3
   b) How will you determine the value of Km? Write down the significance of Km. 3
   c) Define i. Prosthetic group ii. Apoenzyme iii. Co-factor iv. Immobilized enzyme 3
   d) Show the roles of some enzymes in food industry. 3

7. a) What is common end product of carbohydrate, protein, and lipid metabolism? Describe the energy yielding steps of citric acid cycle. 4
   b) What is amino acid pool? Give the reaction of urea cycle that occurs in cytoplasm. 3
   c) Define catabolism. Describe different stages of catabolism when you ingest carbohydrate, protein or lipid food. 3
   d) How glucose is converted to ribose in your body? 2

8. Write down the short notes on the following (any three): 4x3 =12
   a)Chargaff's rule
   b)Protein denaturation
   c)Enzyme specificity
   d)Gluconeogenesis

BFST 1st Year 2nd Semester Final Examination, 2015

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.)

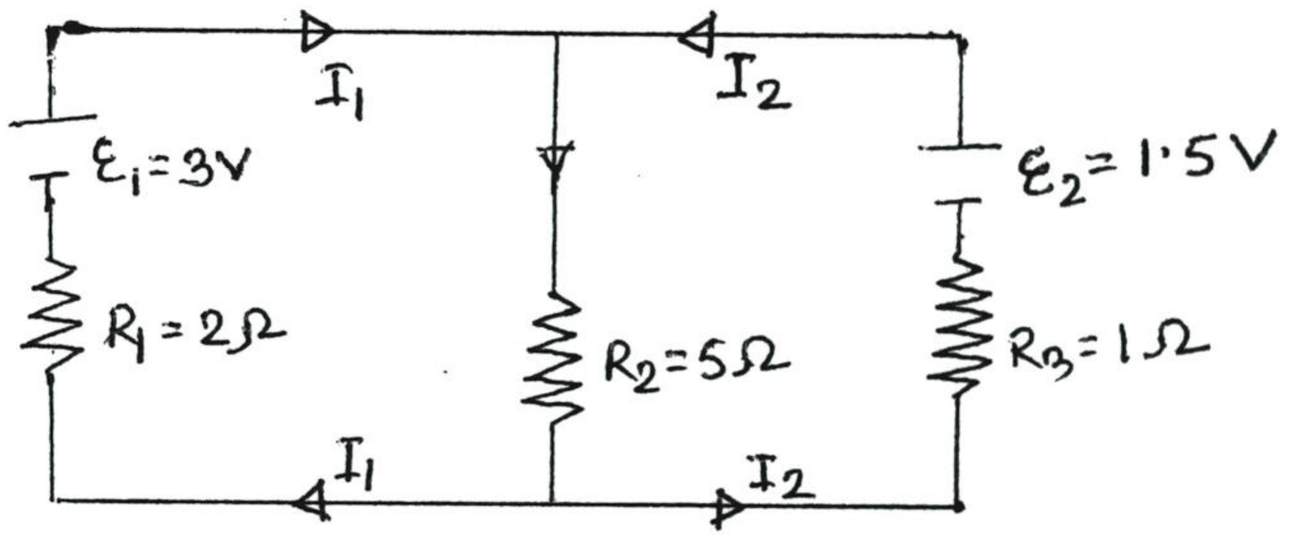
Section-A

1. a) What do you mean by the term "Coherent sources"? State Kirchhoff's voltage law. 2
   b) Show that the phase difference, $\delta = \frac{2\pi}{\lambda} \times path\ difference$ where the symbols have their usual meanings. 3

2. a) "Electric force is very much stronger than Gravitational force"- Explain your answer with electron and proton separated by a distance of about $5.3 \times 10^{-11} m$. 3
   b) What do you mean by the term "Electrical field" of a charged particle? Calculate electric field strength at a point along the line joining of an electronically charged dipole. 4
   c) What do you mean by the term "Electric potential of a charged particle"? Derive an expression for electric potential at a distance 'r' from a charged particle. 3

3. a) State and explain Ohm's law. 2

   b) An electric circuit is made as shown in the following figure; Calculate the current through various branches using Kirchhoff's law. 6



   c) Why does a capacitor block DC but pass AC. 2

4. a) Write the characteristics of the light quanta 'Photon'. 3
   b) State Einstein's photoelectric effect and hence prove that $\frac{1}{2}mv^2{}_{max} = h\vartheta - h\vartheta_0$ where the symbols have their usual meanings. 4
   c) State and Explain Rutherford's atomic model with drawbacks. 3

5. a) What is the basic difference between Energy band and Energy level? Distinguish between conductors, semiconductors and insulators in terms of band diagram. 4
   b) What do you mean by "Depletion region" in a p-n junction diode? Explain the characteristics of the region under forward bias and reverse bias condition. Describe the workings of a diode as half wave rectifier. 6

Section-B

6. a) Draw the electronic symbol of pnp and npn transistor. 2
   b) Define radioactivity. Deduce an expression for decay law of radioactive elements. 3

7. a) What are the differences between interference and diffraction? 3
   b) How would you obtain plane polarized light by reflection? Explain the terms plane of polarization and plane of vibration. 4
   c) Tritium (^3_1H) has a half-life of 12.5 year against beta decay. What fraction of a sample of tritium will remain undecayed after 25 year? 3

8. a) Draw the circuit diagram of LR circuit. Derive an expression for electric current in a simple LR circuit — 4
   b) State Faradays law and Lenz's law for electromagnetic induction and hence show that electromagnetic induction is a consequence of principle of conservation of energy. — 3
   c) Draw the Hysteresis loop for ferromagnetic materials to explain the terms magnetic saturation, retentivity and coercivity. — 3

9. a) Show that for reflected rays to form Newton's rings, the apparent path difference between them is, $x = 2\mu d \cos r$ where the symbols have their usual meanings. — 5
   b) What do you mean by the term" Newton's Rings"? Why do the fringes circular in shape in Newton's Rings? — 2
   c) A parallel beam of wave length of $6 \times 10^{-5} cm$ is incident on a thin glass plate of refractive index 1.5 such that the angle of incident into the plate is 60°. Calculate the smallest thickness which will appear dark by reflection. — 3

10. a) Write the postulates of special theory of relativity. — 2
    b) Discuss, on the basis theory of relativity, the equivalence of mass and energy equation $E = mc^2$ where the symbols have their usual meanings. — 6
    c) Calculate the equivalent energy of 5 a.m.u mass in eV unit. — 2