University of Dhaka
Department of Computer Science and Engineering
B.Sc. in 1st Year 2nd Semester
EEE-1202: Design Logic Design

Total Marks: 30 Times: 1:30 Hours

[Answer any Three (3) of the following Four (4) Questions]			
1.	a)	Define a multiple-output and a single-output functions with examples. Explain some good properties of a multiple-output function with respect to a single-output function by using a decision diagram.	06
	b)	Discuss the construction procedure of a multi-terminal binary decision diagram.	04
2.	a)	How a K-map is used to represent and minimize a Boolean function. Explain in detail.	05
	b)	Construct an AND gate, an OR gate, and an EX-OR gate using transistors, diode, and registers.	05
3.	a)	Why do we need to study the number system? Justify your answer. Design an algorithm to convert the hexadecimal numbers into binary numbers. Use examples to justify your algorithm.	07
	b)	What are the necessities of sequential circuits? Discuss it briefly. When and why sequential circuits are better than combinational circuits? Justify your answer.	03
4.	a)	Calculate the time complexity of SBDD, MTBDD, ~~EMT~~BDD, ~~and MDD~~ for an n-input m-output function and prove them.	06
	b)	Describe the reduction rules and how they led to reduction. Explain three important advantages of an MTBDD over an SBDD using examples.	04

In-course Examination

Physics, CSE-1203

September 21,2022

Answer ALL questions | Time: 1 hour 30 minutes | [Marks 30]

1. (a) Write down the zeroth, first and second laws of thermodynamics and briefly explain concepts of which thermodynamic quantities we get from these laws. [1+1+1]

   (b) Consider an ideal gas undergoing a reversible, quasi-static, adiabatic expansion or compression. Show that the pressure and volume of the ideal gas obey the following relationship $PV^\gamma = K$, a constant. [2]

   (c) Show that in such a reversible, quasi-static, adiabatic expansion or compression, the work done on the gas in expanding from an initial state (P_i, V_i) to a final state (P_f, V_f) is given by: [2]

$$W = -\frac{P_i V_i}{\gamma - 1}\left[1 - \left(\frac{P_f}{P_i}\right)^{(\gamma-1)/\gamma}\right]$$

   (d) Explain entropy of a system by giving its (a) thermodynamic and (b) statistical mechanical definitions. Why is entropy of a system called the "arrow of time"? [1+1+1]

2. (a) Show that the mean free path of the gas molecules in an ideal gas is proportional to the absolute temperature. You may start from the formula of the mean free path. [2]

   (b) The Maxwell-Boltzmann speed distribution formula is given by

$$N_v(v) = 4\pi N\left(\frac{m}{2\pi k_B T}\right)^{3/2} v^2 e^{-mv^2/2k_B T}$$

   i. Calculate the mean speed $\langle v\rangle$ and the mean inverse speed $\langle 1/v\rangle$ verifying that they satisfy the following relation: [2+(1.5+0.5)]

$$\langle v\rangle\langle 1/v\rangle = 4/\pi$$

   (Useful integrals: $\int_0^\infty x^{2s+1}\exp[-ax^2]dx = s!/(2a^{s+1})$, $\int_0^\infty x^n \exp[-x]dx = n!$.)

   ii. What fractional error do you make if you approximate $\sqrt{\langle v^2\rangle}$ by $\langle v\rangle$ (i.e. instead of using $\sqrt{\langle v^2\rangle}$, you use $\langle v\rangle$)? [1]

   iii. From the speed distribution law, find the energy distribution law for the molecules. [1]

   iv. Find the average kinetic energy and the most probable kinetic energy for the gas molecules. [1+1]

3. (a) Explain crystalline, polycrystalline and amorphous solids. [1+1+1]

   (b) Consider Bravais lattices in three dimensions.

   i. Draw clear figures of the seven classes of Bravais lattices in three dimensions, mentioning their subclasses, if any. There are in total fourteen crystal structures that belong to these seven classes.

   ii. Mention the relationship between the primitive lattice vectors and the angles between them in these classes.

   iii. Mention the symmetries of each class.

   [7 × (0.25 + 0.25) + (0.25) + (0.25) = 7]

University of Dhaka
In Course Examination
Course: MATH 1204
Total Marks: 30
Time: 1 Hour 15 Minutes

1. Show that 4

$$y = 4e^{2x} + 2e^{-3x}$$

is a solution of the initial-value problem

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0,$$

$$y(0) = 6,$$

$$y'(0) = 2.$$

Is $y = 2e^{2x} + 4e^{-3x}$ also a solution of this problem? Explain why or why not.

2. What can we do convert a separable differential equation to an exact differential equation? 2

3. For what values of p the following integral is convergent? 4

$$\int_1^\infty \frac{1}{x^p}\,dx$$

4. Solve any 4 of the following differential equations: 4 x 5

(i) $(5xy+4y^2+1)\,dx+(x^2+2xy)\,dy = 0$

(ii) $dy/dx + y = xy^3$

(iii) $(x^2 + 1)\,dy/dx + 4xy = x$, where $y(2) = 1$

(iv) $(2s^2 + 2st + t^2)\,ds + (s^2+2st-t^2)\,dt = 0$

(v) $(x^2 - 3y^2)\,dx + 2xy\,dy = 0$