

Sakib

2nd Year 1st Semester Examination - 2020
 Department of Computer Science and Engineering
 Islamic University, Kushtia
Course Code: CSE 2105
Course Title: Digital System

2105

Time: 04 hours

Full Marks: 70

Answer any five questions

1.	(a) Define Boolean algebra. Why Boolean algebra used?	3
	(b) What do you mean by literals and duality principles? Reduce the following Boolean expression to the required number of literals: i) $ABC + A'B'C + A'BC + ABC' + A'B'C'$ to five literals ii) $(A+C+D)(A+C'+D)(A+C'D)(A+B')$ to four literals	2+3
	(c) What do you mean by minterm and maxterm? Express the following functions in a sum of minterms and a product of maxterms: i) $F(A,B,C,D) = D(A'+B)+B'D$ ii) $F(x,y,z) = (xy+z)(y+xz)$	2+4
2.	(a) Given the following Boolean function: $F = A'C + A'B + AB'C + BC$ i) Express it in sum of minterms. ii) Find the minimal sum of products expressions.	4
	(b) Using k-map simplify the following switching function and implement it using NOR gate only i) $F(x_1, x_2, x_3, x_4) = \sum m(1, 4, 5, 6, 7, 9, 10, 11, 13, 14)$ ii) $F(x_1, x_2, x_3, x_4) = \sum m(1, 3, 7, 11, 15) + \sum d(0, 2, 5)$	5
	(c) Simplify the following Boolean function by using Q-McCluskey method $F(w, x, y, z) = \sum (1, 4, 6, 7, 8, 9, 10, 11, 15)$	5
3.	(a) Write the truth table of half adder. Draw the circuit diagram for its sum and carry. (b) Draw a 4-bit full adder circuit and describe its limitations. (c) Construct a 3-bit look-ahead carry adder.	5 4 5
4.	(a) Define latch. What are flip flops and its types?	1+1 +2=4
	(b) What is JK Flip Flop? Explain its circuit diagram & truth table. Why JK flip-flop is called universal flip flop?	1+4 +2=7
	(c) What is the advantage of a D flip-flop over the SR flip-flop?	3
5.	(a) What is a register and counter? What is the main difference between a register and a counter? (b) What is a 4-bit shift register? How does a 4-bit shift register work? (c) What are the types of counter? Write the difference between synchronous and asynchronous counter.	2+3 =5 2+3 =5 2+3 =5
6.	(a) Define ADC and DAC. What are the types of ADC and DAC? (b) How does R2R ladder DAC work? Why R2R ladder is better than weighted resistor method? (c) Write the real life application of DAC and ADC.	2+3 =5 4+2 =6 3
7.	(a) What is parallel adder? What is the difference between parallel and serial adder? (b) What are encoder and decoder with example? How do encoder and decoder work? (c) What are the difference between multiplexer and de-multiplexer?	2+3 =5 2+4 =6 3
8.	(a) Design a 4-bit DAC using R-2R ladder. (b) An 8-bit DAC has step size 10mV. What is its i) Full scale output and ii) Resolution? (c) Define the following: i) Access mode ii) Cycle time.	6 5 3

B.Sc.(Honours) 2nd Year 1st Semester Final Examination-2019

Department of Computer Science and Engineering

Islamic University, Kushtia.

Course Code: CSE 2105

Course Title: Digital System

Time: 04 Hours

[Answer any five questions]
[The number in the right margin indicate marks]

Full Marks: 70

1. a) Why binary number is used in computer? What are Alphanumeric and ASCII codes? 4
b) Convert following:
(i) $(1671.185)_{10}$ to binary number, Five bits after binary points. 6
(ii) $(654.46)_{10}$ to octal and
(iii) $(567)_{10}$ to BCD
- b) Give the floating-point representation of 10110011.101 using 8-bit and sign magnitude form. 4
2. a) Define Boolean algebra. Why boolean algebra used? 4
b) Express the boolean function $F = A + \bar{B}C$ in a sum of minterms. Also express the Boolean function $F = xy + \bar{x}\bar{y}$ in a product of maxterm form. 4
c) What do you mean by minterm and maxterm? Convert following to the other canonical form.
(i) $f(x,y,z) = \Sigma(1,3,7)$
(ii) $f(A,B,C,D) = \Sigma(0,2,6,11,13,14)$ 6
3. a) State and describe De Morgan's law and also verify any one of them for any two inputs. 5
b) Simplify the Boolean expression $f(a,b,c,d) = \Sigma(1,3,7,13)$ and draw the functions using NOR gates only. 5
c) What are the basic gates? Why NOR gate is called an universal gate? 4
4. a) Distinguish between full adder and half adder circuit. What is carry bit? 4
b) What is parallel adder? Why it is called parallel? Write the advantages of it. 3
c) Write the differences between combinational and sequential logic circuits with circuit diagram. 3
d) Draw and explain a 3-bit look ahead carry adder. 4
5. a) Define multiplexer and demultiplexer. 4
b) What is decoder? Design and explain a 7-segment decoder. 5
c) Write some applications of a demultiplexer. 2
d) Explain how a decoder can be used as a demultiplexer. 3
6. a) What is latch? 2
b) Define and distinguish between asynchronous and synchronous sequential circuits. 4
c) Draw a clocked RS flip-flop using NOR gates only and also explain its operation. 5
d) Write some applications of Flip-flops. 3
7. a) What is shift register? Design and explain the operation of a 3-bit shift register with parallel load. 6 1216
b) What is propagation delay? 2
c) Explain the operation of a 4-bit R-2R ladder DAC. 6
8. a) Write short notes on the followings:
(i) Analog and Digital converter 4x3.5=14

10001110
x1

2nd year B.Sc. (Honours) Final Examination-2018

Dept. of Computer Science and Engineering

Course Code: CSE208

Course Title: Digital Logic Design and Systems

Nisus
2017-18

Full Marks: 75

Time: 04 Hours

(Answer any five questions.)

1. (a) What do you mean by radix and efficiency of a number system? 3
- (b) Convert the followings: 6
- i) $(23.15)_{10}$ to a number system of base 5.
 - ii) $(46.35)_8$ to Hexadecimal.
 - iii) $(476)_{10}$ to BCD.
- (c) Explain with example how we represent floating point number in computer? 6
2. (a) Describe De Morgan's law and verify these laws for two inputs. 4
- (b) Draw the function using NAND gate only: $F = \bar{A}\bar{B}C + \bar{B}\bar{C}D + \bar{A}\bar{B}CD + A\bar{B}\bar{C}$ 4
- (c) Design a full-adder circuit using NOR gates only. 5
- (d) Write the postulates of Boolean algebra. 2
3. (a) What are the limitations of Karnaugh map? 2
- (b) Using k-map simplify the following function and implement it using NAND gates only. 7
- $$f(x_1, x_2, x_3, x_4) = \sum m(0, 1, 3, 5, 7, 11, 12, 13) + \sum d(2, 8, 9)$$
- (c) What do you mean by minterm and maxterm? Find the minterm and maxterm notation of the following switching function. 6
- $$f(x_1, x_2, x_3) = (x_1x_3 + x_1x'_2x'_3 + x'_1x_2x'_3 + x'_1x'_2x'_3).$$
4. (a) What is multiplexer? Illustrate 8:1 multiplexer diagram. 5
- (b) Design and describe a 7 segment decoder. 5
- (c) Define decoder? Design a BCD to decimal decoder. 5
5. (a) Distinguish between combinational logic and sequential logic circuit. 2
- (b) Describe the operation of JK flip-flop and find its characteristic equation. 5
- (c) Explain race around condition in Flip-Flop? 3
- (d) How can you construct D and T type flip-flop? 5
6. (a) Distinguish between asynchronous and synchronous counter. 4
- (b) Explain the logic diagram of an asynchronous decade counter 7
- (c) Describe the propagation delay in Ripple counters. 4
7. (a) Explain with block how computer communicates with physical variables? 4
- (b) Describe the operation of ladder type Digital to Analog converter. What are its advantages and disadvantages? 7
- (c) A certain 10-bit R/2R ladder type Digital to Analog converter uses $V_{REF} = -5V$. What is the resolution and full-scale output of this converter? 4
8. Write short note on followings (Any Three): 15
- (a) Shift Register
 - (b) Digital Volt Meter
 - (c) ADC
 - (d) Cache Memory

1. a) Why binary number system is used in computer? What is Alphanumeric code and ASCII code? 3

b) Convert the followings: 4

- i) $(1761.185)_{10}$ to binary number up to five binary bits after binary point.
- ii) $(987.56)_{10}$ to hexadecimal

c) Give the floating-point representation of 110110.101 using 8-bit and sign magnitude form. 4

d) What is the difference between fixed point and floating-point numbers? 4

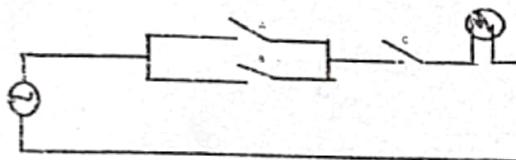
2. a) Convert the following numbers from one base to another as desired below: 4.5

i) $(111.011)_5 = (?)_{10}$ ii) $(277)_3 = (?)_{10}$ iii) $(277)_8 = (?)_1$

b) State and explain DeMorgan's theorem. ✓ 4

c) Prove that $x+xy = x$ using the postulates of Boolean algebra, where x and y are Boolean variables. 3

d) Express the following switching circuit in binary logic notation: 3.5



3. a) Define i. literal ii. minterm and iii. maxterm 3

b) Simplify the following Boolean function to a minimum number of literals: 3

i. $xy+x'z+yz$

c) Express the Boolean function $F=xy+x'z$ in a product of maxterms. ✓ 3

d) Prove that the sum of all minterms of a Boolean function of n (e.g., n=3) variables is 0. 3

e) Why NAND is called a universal gate? Explain. 3

4. a) Define i) Access time ii) Cycle time iii) Data transfer rate iv) Seek time 6

b) What are the major characteristics of main memory? 3

c) Distinguish between SRAM and DRAM. 3

d) What do you mean by refreshing of memory? Why it is used? 3

5. a) What is the difference between Combinational and Sequential logic circuit? 3

b) What is a Flip-Flop? Name different types of Flip-Flop and write their characteristic equations. 5

c) Explain the operation of J-K Flip-Flop with diagram and truth table. ✓ 5

d) What is race around condition in Flip-Flop? 2

6. a) What is digital counter? Explain the operation of a 4-bit asynchronous counter. 5

b) What is shift register? Design a 4-bit register with parallel load. 4

c) Write the functions of decoder, encoder, multiplexer, and de-multiplexer. 6

7. a) What is Mealy machine and Moore machine? 2

b) Draw and explain the i) transition table ii) state table and iii) state diagram of a sequential logic circuit described by the following excitation function of D type flip-flop:

$$Y_1=x_2+y_2; \quad Y_2=y_1y_2; \quad Z=x_1y_1$$

c) Explain how we can obtain D and T type flip-flops from JK flip-flop. 3

8. a) Design and explain the operation of a 3-bit R/2R ladder digital to analog converter. 5

b) What do you mean by step size and resolution of a digital to analog converter (DAC)? 6

An eight bit DAC has step size 8 mv. What is its

- i. full scale output and ii. resolution?

c) Explain how a decoder can be used as a de-multiplexer. ✓ 4

2nd Year final Examination 2016
 Department of Computer Science and Engineering (CSE)
 Islamic University, Bangladesh.
 Course Code: CSE 208
 Course Title: Digital Logic Design and Systems

Time: 04 Hours

Answer any five questions.

Full Marks: 75

1. a) Why binary number system is used in computer? What is Alphanumeric code and ASCII code? 3
 b) Convert the following: (i) $(1761.185)_{10}$ to binary number, five bits after binary points. 5
 (ii) $(987.56)_{10}$ to hexadecimal and
 (iii) $(476)_{10}$ to BCD. 3
 c) Give the floating-point representation of 110110.101 using 8-bit and sign magnitude form. 4
 d) What is normalization? Why we need it. 3
2. a) Describe De Morgan's law and verify these laws for two inputs. 5
 b) Simplify and draw the function using NAND gate only: $F = \bar{A}\bar{B}C + \bar{B}CD + \bar{A}BCD + AB\bar{C}$ 3
 c) Design a full-adder circuit using NAND gates only. 5
 d) Write the postulates of Boolean algebra. 2
3. a) Why minimization or simplification is necessary in logic circuit design? Write the names of different types of minimization techniques. 3
 b) Using k-map simplify the following function and implement it using NAND gates only. 7

$$f(x_1, x_2, x_3, x_4) = \sum m(0, 1, 3, 11, 12, 13) + \sum d(2, 8, 9)$$

What do you mean by minterm and maxterm? Find the meanterm and maxterm notation of the following switching function. 5

$$f(x_1, x_2, x_3) = (x_1 x_3 + x_1 x_2' x_3' + x_1' x_2 x_3' + x_1' x_2' x_3')$$
4. a) Construct a BCD-to-decimal decoder. 6
 b) Discuss the operation of a multiplexer. How do you get a 8:1 multiplexer by using two 4:1 multiplixer? 6
 c) What is the function of Decoder, Encoder, Multiplexer, and Demultiplexer? 3
5. a) What is a latch? 2
 b) Define and distinguish between asynchronous and synchronous sequential circuits. 3
 c) Draw a clocked RS flip-flop using NOR gates only and also explain its operation. 5
 d) Write some applications of Flip-flops. 3
 e) What is the difference between Combinational and Sequential logic circuit? 2
6. a) What is Mealy machine and Moore machine? 2
 b) Draw the i) Transition table ii) State table and iii) State diagram of a sequential logic circuit described by the following excitation function of D type flip-flop : 10

$$Y_1 = x_2 + y_2$$

$$Y_2 = y_1 y_2$$

$$Z = x_1 y_1$$
 c) Explain how we obtain D and T flip-flops from JK flip-flop? 3
7. a) Write the difference between synchronous and asynchronous counters. 3
 b) What is propagation delay? 2
 c) Explain the operation of an n-bit R-2R ladder digital to analog converter. 6
 d) A 8-bit Digital to Analog converter has a stem size of 10mV. What is its full-scale output and resolution? 4
8. Write short note on followings (Any Three) 15
 a) Shift Register
 b) Digital Volt Meter
 c) ADC
 d) Cache Memory

Islamic University
2nd Year Final Examination-2016
Department of Computer Science and Engineering
Course Code: CSE 202
Course Title: Algorithms

Full Marks: 75

Time: 04 Hours

Answer any five of the following:

1. **a)** Define algorithm. Describe the criteria that all algorithms must satisfy. 5
b) Define the terms i) Algorithm validation, ii) Program verification, iii) Debugging, and iv) Profiling 4
c) Mention the criteria upon which you can judge an algorithm. 3
d) Define step count. Count the number of steps of the following statement.

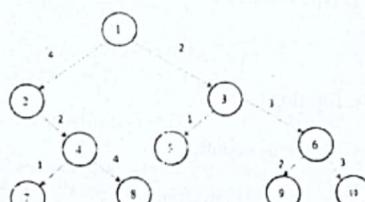
$$\text{return } a+b+c*C+(a+b-c)+4.0i$$
 3

2. **a)** Briefly describe different asymptotic notations used in complexity analysis. 6
b) Prove that if $f(n) = a_m n^m + \dots + a_1 n + a_0$, then $f(n) = O(n^m)$. 3
c) Write a recursive algorithm to find the maximum and minimum of n numbers and discuss its complexity analysis. 6

3. **a)** Define the following data structures: stacks, queues, Trees and Heaps 4
b) Define binary search tree with its satisfying properties. Give an example. 2
c) Briefly explain randomized algorithm. 3
d) Write an algorithm to find and delete a given ITEM in a binary search tree. 6
 Also find its complexity with Big Oh notation.

4. **a)** Explain divide-and-Conquer strategy with an example. 4
b) Suppose you have given a list of a elements: 2+3=5

$$a: 22, 13, -5, -8, 15, 60, 17, 31.$$
 - i) Build a tree using recursive calls on the list for finding the maximum and minimum -
 - ii) Find the number of comparisons needed for Maximum. -**c)** Write quicksort algorithm. On which input does the quicksort algorithm exhibit its worst-case behavior? 4+2=6

5. **a)** Suppose you have given a weighted tree. 2


Construct a tree after splitting the nodes which required for $\delta = 5$ from the trees.

- b)** The following table shows the data about the number of tasks. Each task has a start time and a finish time. Consider the supply of machines to perform the task is infinite. Discuss the scheduling operations of the tasks and machines using greedy method. 5

task	a	b	c	d	e	f	g
start	0	3	4	9	7	1	6
finish	2	7	7	11	10	5	8

- c)** Define spanning tree and write its application. 3
d) Write Prim's algorithm to obtain the minimum-cost spanning tree from the graph. 5

6. **a)** What do you mean by dynamic programming? Write the steps to design a dynamic programming algorithm. 2+4=6
b) Define multistage graph. Consider the following graph. Identify the shortest path from S to T using dynamic programming approach. 7

2nd Year B.Sc. (Hon's) Final Examination-2015
 Dept. of Computer Science and Engineering
 Islamic University, Kushtia
CSE 208: Digital Logic Design and Systems

Full Marks: 75

Time: 4 hours

Answer any five questions
 (Figures in the right margin indicate marks)

1. (a) Define Boolean algebra. Why Boolean algebra used? 3
- (b) What do you mean by literals and duality principles? Express the Boolean function $F=A+B'C$ in a sum of minterms. Also express the Boolean function $F=xy+x'y$ in a product of maxterm form. 6
- (c) What do you mean by minterm and maxterm? Convert the following to the other canonical form. 6

i) $f(x,y,z) = \sum(1,3,7)$

ii) $f(A,B,C,D) = \sum(0,2,6,11,13,14)$ ✓

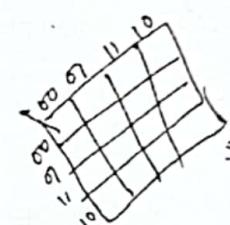
2. (a) Given the following Boolean function: $F=A'C + A'B + AB'C + BC$ 4
 - i) Express it in sum of minterms.
 - ii) Find the minimal sum of products expressions.
- (b) Using K-Map simplify the following switching function and implement it using NOR/NAND gate only. 6

i) $f(x_1, x_2, x_3, x_4) = \sum m(1,4,5,6,7,9,10,11,13,14)$

ii) $f(x_1, x_2, x_3, x_4) = \sum m(1,3,7,9,11,15) + \sum d(0,2,5)$

- (c) Simplify the following Boolean function by using Q-McCluskey method 5

$f(w,x,y,z) = \sum(1,4,6,7,8,9,10,11,15)$ ✓



3. ✓ (a) Write the truth table of a half adder. Draw the circuit diagram of a half adder using Exclusive-OR gate. 5
- (b) Define decoder? Design a BCD to decimal decoder. 6
- (c) Distinguish between combinational and sequential logic circuit. 4

- ✓ (a) Design an 8 to 1 line multiplexer using two 4 to 1 line multiplexers.
- (b) Define multiplexer and demultiplexer. How can a decoder be used as Demultiplexer explain.
- (c) Implement the following with a multiplier: $F(A,B,C,D) = \sum(0,1,3,4,8,9,15)$.

- ✓ 5 (a) What is the reason to use JK flip-flop. Draw the circuit diagram of a clocked JK flip-flop. 5
- (b) What is a latch? Design a SR flip-flop with NAND gates only.. 5
- (c) What is a flip-flop? List different types of flip-flop with their characteristics equations. 5

6. (a) Design a 4-bit register with parallel load. 5
- (b) Design a BCD counter with proper diagram. 4
- (c) What is MOD number? Explain the operation of a four-bit asynchronous counter. 6

- ✓ 7 (a) Define Ripple counter and synchronous counter. 4
- (b) Distinguish between asynchronous and synchronous counter. 4
- (c) Describe the propagation delay in Ripple counter. 4
- (d) Write some applications of a counter. 3

- ✓ 8 (a) Design a 4-bit DAC using R-2R ladder. 4
- (b) Describe DRAM structure and operation. 5
- (c) An 8-bit DAC has step size 10mV. What is its i) Full Scale output and ii) Resolution? 4
- (d) Define the following i) Access Mode ii) Cycle time. 2

2nd Year Final Examination-2013
Department of Computer Science and Engineering, Islamic University
Course: CSE 208-Digital Logic Design and System

Time: 04 Hours

Full Marks: 75

Answer any five of the following:

- | | | |
|----|--|---|
| 1. | a) Draw and explain the block diagram of a digital computer. Write some advantages and disadvantages of digital systems. | 4 |
| | b) Explain the principle of duality in Boolean algebra. How is it useful? Give the dual of the rule
$A + \bar{A} \cdot B = A + B$ | 3 |
| | c) Describe deMorgan's law and verify these laws for two inputs. | 4 |
| | d) Show the implementation of the logical operations AND, OR and NOT only with NAND gates and only with NOR gates. | 4 |
| 2. | a) Simplify the following Boolean function in i) sum of products and ii) product of sums.
$F(A,B,C,D) = \sum(0,1,2,5,8,9,10)$ | 6 |
| | b) Simplify the Boolean function F in sum of products using the don't-care conditions d:
$F = y' + x'z', d = yz + xy$ | 4 |
| | c) Simplify the following Boolean function by means of the tabulation method.
$F(w,x,y,z) = \sum(1,4,6,7,8,9,10,11,15)$ | 5 |
| 3. | a) Write the truth table of a full adder. Construct logic diagram for a full-adder using it. | 4 |
| | b) Design a BCD-to-seven-segment decoder. | 5 |
| | c) Draw the logic diagram of a 1-line to 8-line demultiplexer and illustrate with circuit diagram. | 4 |
| | d) Construct or Design a 8:1 multiplexer using two 4:1 multiplexer. | 2 |
| 4. | a) Differentiate between Combinational and Sequential logic circuits? | 3 |
| | b) What is a Flip-Flop? Name different types of Flip-Flop and write their characteristic equation. | 6 |
| | c) What is race around condition in Flip-Flop? Draw the circuit diagram of JK master-slave FF. | 4 |
| | d) What is Mealy machine and Moore machine? | 2 |
| 5. | a) What is MOD number? Explain the operation of a four-bit asynchronous counter. | 5 |
| | b) Write the operation of a synchronous counter and also its advantage over asynchronous counter. | 6 |
| | c) What is ring counter? Write some application of counters. | 4 |
| 6. | a) How we get digital signal from physical variable? | 2 |
| | b) What are the common methods for Analog to Digital conversion? Explain the successive approximate method for Analog to Digital conversion. | 5 |
| | c) Draw and explain the operation of a 5-bit register type Digital to analog converter (DAC). What are its advantage and disadvantage? | 5 |
| | d) An 8-bit DAC has step size 10mV. What is its (i) full-scale output and (ii) resolution? | 3 |
| 7. | a) What do you mean by ring counter? | 2 |
| | b) Differentiate between synchronous and asynchronous counters. | 3 |
| | c) Draw the diagram and explain the operation of a 4-bit look ahead carry synchronous counter. | 5 |
| | d) What do you mean by modulo-M counter? | 3 |
| | e) Write some application of counters. | 2 |
| 8. | a) Explain the memory hierarchy in a computer? | 4 |
| | b) Explain with diagram the operation of a RAM. | 5 |
| | c) Distinguish between SRAM and DRAM. | 3 |
| | d) What do you mean by memory refreshing? Why it is used? | 3 |

Sakib

Department of CSE, Islamic University, Kushtia
 Second Year First Semester Final Examination 2020

Course Title: Economics, Government and Sociology Course Code: HUM-2107
 Time: 04 hours; Full Marks: 70.

Answer any 5 (five) of the following questions.
 (All parts of each question must be answered consecutively)

1. a. What is economics? Why do engineers need to learn about economics? 05
 b. Categorized different types of economic systems. 04
 c. Explain fundamental problems of economics and the mechanism through which 05
 these problems are solved.
2. a. Define opportunity cost. Say, there are two alternative products A and B, product B has 03
 low opportunity cost than A in production . In this case , which product will be chosen
 by the producer for profit maximization?
 b. Distinguish between demand and quality demand.Explain the determinants of 04
 quality demand
 c. Explain demand curve with a hypothetical demand scheduleon the basis of 04
 demand law.
 d. When does supply curve shifts and moves? Show graphically. 03
3. a. Define elasticity. What do you mean by price, income and cross elasticity of demand? 06
 b. Discuss calculation methods of different price elasticity graphically. 06
 c. Explain the usage of elasticity in policy making with example 02
4. a. Define economic growth and development 04
 b. What are interregional and international trade, exchange rate and balance of 06
 payment, tariff and quota?
 c. Explain the effects of tariff on investment, export and import 04
5. a. Write down at least ten macroeconomic variables. What are the main objectives 05
 of macroeconomics?
 b. In which situation and when macroeconomics was introduced? 04
 c. Is growth of GNP an unfailing index of a country's economic progress? - State 05
 your opinion.
6. a. Explain social structure of Bangladesh 06
 b. What is meant by industrial revolution? How industrialization and urbanization 04
 does interlinked?
 c. Explain administrative system of developed countries like Japan. 04
7. a. Define sociology. Is sociology a science? Comment. 04
 b. Discuss the relationship between Sociology and Economics. 04
 c. What do you mean by crime? Is there any relationship between cyber crime and 06
 sociology? – Explain.
8. a. Define cyber crime 04
 b. How does sociology and cyber crime interrelated? 04
 c. Describe causes and remedies of cyber crime 06

Sakib

2nd Year 2nd Semester Examination-2020
Department of Computer Science and Engineering
Islamic University, Kushtia

Course Code: CHEM 2211**Course Title: Chemistry**

Time: 04 Hours

Full Marks: 70

Answer any five of the following

1. a) What do you mean by atomic number? Draw a structural diagram of Mg (12) atom. 1+2
 b) Describe the limitations of Rutherford's atomic model. 5
 c) Explain why atoms of different elements can have the same mass number and neutron number, but they can't have same number of protons. 4
 d) How are ions formed? 2

2. a) Why are noble gases so unreactive? 2
 b) Write short notes on: 9
 - i) Diagonal relationship between elements.
 - ii) The position of Hydrogen in the periodic table
 - iii) The position of rare earth elements in the periodic table

- c) Distinguish between Compound and Element. 3

3. a) Distinguish between Ionic and covalent bonds 4
 b) Explain the formation of Ionic bond with example and figure. 5
 c) What are metallic compounds and why they conductive? 3
 d) What is hydrogen bonding 2

4. a) Define Solution with example. 2
 b) What do you know by the term 'Solute' and 'Solvent'? 3
 c) Write some properties of solvents change in solutions. 3
 d) Define the following terms: 6
 - i. Molarity
 - ii. Molality
 - iii. Normality

5. a) What is an azeotrope or azeotropic mixture? 2
 b) Explain why a mixture of water and benzene cannot be separated by distillation 3
 c) If 22 g of benzene is dissolved in 122 g of carbon tetrachloride, determine the mass percentage of carbon tetrachloride (CCl₄) and benzene (C₆H₆). 3
 d) What is Raoult's law and also write its limitations. 4
 e) What is meant by the term "Osmosis" and Osmotic Pressure"? 2

6. a) What do you understand by Exothermic and Endothermic reactions/process? 3
 b) Define the following terms: 6
 - (i) Heat of solution;
 - (ii) Heat of neutralization;
 - (iii) Heat of vaporization;
 - (iv) Heat of formation.

- c) State and explain Hess's law of constant heat summation. 5

7. a) What do you understand by pH value? Explain the importance of pH in health issue and beautification. 1+3
 b) Why all metals are electrical conductor? 2
 c) What is acid rain? Explain the negative effects of acid rain. 4
 d) What do you understand by hardness of water? How does it cause problems in our daily life? 4

8. a) What is an exothermic reaction? Give an example of exothermic reaction. 2
 b) Why heat is necessary in the photosynthesis process? 3
 c) Analyze the energy diagram of exothermic and endothermic reaction. 5
 d) Calculate the bond energy of N-H of the reaction N₂+ 3H₂ ⇌ 2NH₃ 4

Second Year First Semester Examination-2020*Dept. of Computer Science and Engineering***Course Code:** CSE 2101**Course Title:** Discrete Mathematics**Full Marks: 70****Time: 04 Hours***(Answer any five questions.)*

1. a) Define Proposition, Disjunction and Implication. 6
 b) Define tautology and contradiction with example. 3
 c) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. 3
 d) What do you mean by Converse and Contrapositive of $p \rightarrow q$. 2
2. a) What do you mean by universe of discourse? 2
 b) Define existential and universal quantifications. 4
 c) Let $Q(a,b)$ denote the statement " $x=y-2$ ". Write the truth values of the propositions $Q(3,5)$ and $Q(2,5)$ 4
 d) Translate the following statement $\exists x \forall y \forall z ((F(x,y) \wedge F(x,z)) \rightarrow \neg F(y,z))$ into English expression, where $F(a,b)$ means a and b are friends and the domain for x,y and z consists of all students of your university 4
3. a) Define lemma, corollary, conjecture. 6
 b) Using truth table prove that $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent. 4
 c) Prove the theorem "the integer n is odd if and only if n^2 is odd". 4
4. a) Define functions and mapping of a function. 4
 b) Define the following properties of function i) One-to-One ii) onto and iii) Bijection. 6
 c) What are the floor and ceiling function? 4
5. a) Define relation. How many relations are there on a set with n elements? 2+2
 b) Define symmetric, asymmetric, and transitive relation with example 6
 c) Prove that R on a set A is transitive if $R^n \subseteq R$ for $n = 1, 2, 3, \dots$ 4
6. a) Use Bubble sort to sort the list {3 2 4 1 5 -2} in descending order 6
 b) What is law of detachment? 2
 c) Find the Greatest Common Divisor of 414 and 662 using Euclidean algorithm and also write pseudocode of it. 6
7. a) Illustrate mathematical induction 5
 b) Prove the inequality " $n < 2$ " using mathematical induction for all positive integers n. 5
 c) Explain forward and backward reasoning. 4
8. a) What do you mean by level of vertex and height of a tree? 4
 b) Describe complete binary tree with example. 4
 c) Define i) Simple graph ii) Multigraph iii) Directed graph. Give examples of each. 6

Course Code: CSE 1205

Time: 04 hours

Course Title: Discrete Mathematics

Full Marks: 70

[Answer any five questions]

a) Define Proposition, Tautology and Contradiction. 4

b) Show that $(p \wedge q) \rightarrow (\neg p \vee \neg q)$ is a tautology. 4

c) Define Converse, Contrapositive and Inverse with example. 6

a) Explain conjunction and disjunction operation of a Proposition. 4

b) Explain universal and existential quantification. 6

c) Let $Q(x)$ be the statement " $x < 3$ ". What is the truth value of $\forall_x Q(x)$, where the universe of discourse consists of all real numbers. 4

a) Explain one to one and onto function. 6

b) Define Big-O notation, floor and ceiling function with example. 4

c) Explain bubble sort with example. 4

4. a) Describe what is meant by direct proof, an indirect proof and a proof by contradiction of an implication $p \rightarrow q$. Why is studying methods of prove important? 3+1

b) Discuss different types of fallacies those arise in incorrect arguments. 2

c) What is called modus ponens? When an argument is called valid? 2

d) Show that if $d = GCD(a, b)$ then $d = sa + tb$ for some integers s and t . 3

e) Prove that $\sqrt{2}$ is an irrational number by the method of contradiction. ✓ 3

f) a) Explain mathematical Induction. 4

b) Use mathematical induction to show that $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$ for all non-negative integers n . 6

c) Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent. 4

6. a) Let $G = (V, E)$ be an undirected graph with e edges. Show that $2e = \deg(v)$. 4

b) What is Bipartite graph, Regular graph, Planar simple graph, and Chromatic number of a graph? 6

c) Represent each of the following graphs with an adjacent matrix: K_6 , W_5 , Q_2 , $K_{2,3}$. 4

7. a) What is Extended binary tree or 2-tree? What is Internal node and External node? 4

b) Let a 2-tree has 5 internal nodes and internal path length is 6. What is its external path length? 3

c) Prove that the maximum number of levels in an m -ary tree of height h is m^h . 3

d) Define Euler circuit and Euler path in an undirected graph. 4

8. a) Explain reflexive and symmetric relation. 5

b) For the set $A = \{1, 2, 3, 4\}$, give an example of transitive and anti-symmetric relation. 4

c) Prove that the relation R on a set A is transitive if and only if $R^n \subseteq R$ for $n = 1, 2, 3, \dots$ ✓ 4

2nd Year B.Sc. (Hons.) Final Examination- 2017

Dept. of Computer Science and Engineering

Islamic University, Kushtia

Course Title: Algorithms, Course Code: CSE 203

Full Marks: 75

Time: 04 Hours

[Answer any five of the following questions. Figures in the right margin indicate marks.]

1.	a) Define proposition. What do you mean by converse and contrapositive of $p \rightarrow q$?	4
b)	Show that $(\neg Q \wedge (\neg P \rightarrow Q)) \rightarrow \neg P$ is a tautology.	3
c)	Explain universal and existential quantification.	4
d)	Define power set. Is any difference between the power set of empty set and the power set of $\{\emptyset\}$?	4
2.	a) Show that $(P \wedge Q) \rightarrow (P \vee Q)$ is a tautology.	4
b)	Define predicate with example.	2
c)	Let $Q(x,y)$ denote the statement " $x=y+2$ ". What are the truth values of the proposition: $Q(1,2)$ and $Q(3,0)$?	3 4
d)	What are the negations of the statements $\forall x (x^2 > x)$ and $\exists x (x^2 = 2)$?	5
3.	a) Explain the concept of mathematical induction.	2
b)	Using mathematical induction, prove that :	4
	$\sum_{j=0}^{n-1} ar^j = \frac{ar^n - a}{r - 1}, \quad \text{where } r = 1$	
c)	State the division algorithm. Show that if $a = bq+r$, where a,b,q , and r are integers. Then $\text{GCD}(a,b) = \text{GCD}(b,r)$	5
d)	Let n be a composite integer then show that n has a prime divisor less than or equal to \sqrt{n} .	4
4.	a) Define with examples injection, surjection, and bijection.	3
b)	Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x^2 + 3$ and $g(x) = 5x + 1$. Find $(f \circ g)(x)$ and $(g \circ f)(x)$.	3
c)	Define reflexive, symmetric, antisymmetric, and transitive relation.	4
d)	Let R be the relation $\{(1,2), (1,3), (2,3), (2,4), (3,1)\}$, and set S be the relation $\{(2,1), (3,1), (3,2), (4,2)\}$. Find $S \circ R$.	3

5.	a) Explain the false position method for determining roots of equations.	6																					
	b) Find a real root of $f(x) = 9.34 - 2.19x + 16.3x^2 - 3.7x^3$	6																					
	c) Define curve fitting.	3																					
6.	a) Define interpolation and extrapolation.	3																					
	b) Derive Lagrange's polynomial interpolation formula for a polynomial of degree n.	7																					
	c) Apply Lagrange's formula to interpolate $f(1.30)$, using the following values of the function $f(x)$:	5																					
7.	<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>x</th> <th>x0</th> <th>x1</th> <th>x2</th> <th>x3</th> <th>x4</th> <th>x5</th> </tr> </thead> <tbody> <tr> <td>x</td> <td>1.0</td> <td>1.2</td> <td>1.4</td> <td>1.6</td> <td>1.8</td> <td>2.0</td> </tr> <tr> <td>f(x)</td> <td>0.242</td> <td>0.1942</td> <td>0.1497</td> <td>0.1109</td> <td>0.079</td> <td>0.0540</td> </tr> </tbody> </table>	x	x0	x1	x2	x3	x4	x5	x	1.0	1.2	1.4	1.6	1.8	2.0	f(x)	0.242	0.1942	0.1497	0.1109	0.079	0.0540	
x	x0	x1	x2	x3	x4	x5																	
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f(x)	0.242	0.1942	0.1497	0.1109	0.079	0.0540																	
a) State general formula for numerical integration. Deduce Simpson's 1/3 rule.	3+4																						
b) Explain the trapezoidal rule for integration.	4																						
8.	c) Evaluate the following integration; correct to the three decimal places by using Trapezoidal rule.	4																					
	$I = \int_0^1 \frac{1}{1+x} dx$																						
	What is differential equation?	3																					
	Discuss Runge-Kutta fourth order method for solving an ordinary differential equation.	6																					
	Given $\frac{dy}{dx} = xy$, With $y(1) = 5$. Find $y(1,1)$ and $y(1,2)$ using the Runge-Kutta fourth Order method.	6																					

Islamic University

2nd year B.Sc. (Honours) Final Examination-2016
Dept. of Computer Science and Engineering
Course No. CSE-203

Course Title: Discrete Mathematics and Numerical Methods

Time: 04 Hours

Full Marks: 75

(Answer any five questions.)

- 1 (a) Define the following terms i) Proposition, ii) Connectives, iii) Tautology and iv) Contingency. 4
- (b) Show that $\neg q \wedge (p \rightarrow q) \rightarrow \neg p$ is a tautology. 4
- (c) Define implication and biconditional with truth table. 3
- (d) Explain Universal and Existential quantification. 4
- 2 (a) Let $Q(x,y)$ denote the student " $x=y+3$ ". What are the truth values of the propositions $Q(3,4)$ and $Q(6,0)$? 4
- (b) Let p and q be the propositions defined as p : He is a student, q : He is a member of the CSE dept. Write the following compound proposition using p , q and logical connectors: 5
- i) He is a student but not a member of the CSE dept.
ii) If he is a student, he is also a member of the CSE dept.
- c) He is either a student or he is a member of the CSE dept., but he is not a member of the CSE dept., if he is a student. 3
- (e) Define free and bound variable with example. 3
- (d) Define negation of the quantifier. 3
- 3 (a) Define with examples: Injection, Bijection and Surjection. 3
- (b) What do you mean by composition of function? Find composition of (i) f and g (ii) g and f where $f(x) = x^2 + 1$ and $g(x) = x + 2$. 5
- (c) Prove that Identity function has an inverse. 3
- (d) Define relation and function and distinguish between them. 4
- 4 (a) Define modus ponens, lemma, and corollary. 6
- (b) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction. 6
- (c) Define vacuous and trivial proof. 3
- 5 (a) Explain bubble sort with example. 5
- (b) Explain Euclidean algorithm with example. 6
- (c) Let $R = \{(1,1), (2,1), (3,2), (4,3)\}$. Find the power R^n , $n=2,3,4,\dots$ 4
- 6 (a) Define and explain Newton-Raphson method. 5
- (b) Use Newton-Raphson method to find the root of the equation: $x \sin x + \cos x = 0$. 5
- (c) Explain the method of false position. 5
- 7 (a) Explain about mathematical induction? 5
- (b) Use mathematical induction to prove that $n^3 - n$ is divisible by 3 whenever n is a positive integer. 5
- (c) Write the fundamental theorem of arithmetic. Show that if n is a composite integer, then n has a prime divisor less than or equal to \sqrt{n} . 5
- 8 (a) Integrate the following equation 6
- $$\int_0^3 (8 + 4\sin x) dx$$
- i) Analytically
ii) Using single application of Simpson's 3/8 rule.

B.Sc. (Hon's) 2nd Year Final Examination-2015

Dept. of Computer Science and Engineering

Islamic University, Kushtia

CSE 203: Discrete Mathematics and Numerical Methods

Full Marks: 75

Time: 4 hours

*Answer any five questions
(Figures in the right margin indicate marks)*

- ✓ 1. (a) Define propositional logic. Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent. 4
- (b) Define converse, contrapositive and inverse with example. 6
- (c) Let $Q(x)$ be the statement " $x < 2$ ". What is the truth value of the quantification, $\forall Q(x)$ where the universe of discourse consists of all real numbers? 3
- (d) What is bound and free variable? 2
- ✓ 2. (a) Define predicate and domain. 3
- (b) Explain universal and existential quantifier with example. 5
- (c) What are the negations of the statement "There is an honest politician" and "All Americans eat cheeseburgers"? 4
- (d) Define tautology. Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. 7
- ✓ 3. (a) Explain the following rules of inference i) Universal instantiation ii) Universal generalization iii) Existential instantiation iv) Existential generalization. 8
- (b) Define pseudorandom numbers and Big-O-notch. 3
- (c) Use mathematical induction to prove that the sum of first n odd positive integers is n^2 . 4
- ✓ 4. (a) Define i) One-to-One ii) ONTO and iii) one-to-one correspondence functions. 3
- Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. What is the composition of f and g ? What is the composition of g and f ? 4
- (b) When a function has an inverse? Show that $f(x) = 2x + 3$ has an inverse. 3
- (c) Explain floor function and ceiling functions with example. 5
5. (a) How many relations are there on a set with n elements? 3
- (b) Define reflexive, symmetric and antisymmetric relation with example. 3
- Let $R = \{(1, 1), (2, 1), (3, 2), (4, 3)\}$. Find the power R^n , $n=2, 3, 4, \dots$. 3
- (c) Define i) Simple graph ii) Multigraph and iii) Directed graph. Give example of each. 6
6. (a) Discuss the method of bisection to find an approximate root of an equation $f(x)=0$. 5
- (b) Find a real root of the equation $x^3 - 2x^2 - 4 = 0$ using false position method. 5
- (c) Find a real root of the equation $x^3 - 2x^2 - 5 = 0$ using bisection method. 5
- ✓ 7. (a) Explain the general formula of Newton Raphson. 5
- (b) Show that Newton Raphson method has quadratic convergence. 5
- (c) Derive error in Lagrange's interpolation formula. 5
8. (a) Explain fourth order Runge-Kutta method for solving ordinary differential equations. 5
- (b) Write down the algorithms for Gauss-Seidal method. 5
- (c) Develop Simpson's 1/3 rule of numerical integration. 5

2nd Year B. Sc. (Hons) Examination - 2014
Department of Computer Science and Engineering
Islamic University, Kushtia
Course No: CSE 203
Course Title: Discrete Mathematics and Numerical Methods

Time: 04 hours

Full Marks: 75

[Answer any five questions]

1. (a) What do you mean by proposition? Explain with example. 2
 (b) State the converse, contrapositive and inverse of each of these implications. 9
 i) If it snows tonight, then I will stay at home.
 ii) I go to the beach whenever it is a sunny summer day. ✓
 iii) When I stay up late, it is necessary that I sleep until noon.
- (c) Show that $\neg(p \wedge \neg q) \vee q \equiv \neg p \vee q$ are logically equivalent. 4
2. (a) Define with example i) Scope of variable ii) Free variable iii) Bound Variable. 4
 (b) What is normal form? Explain with example i) DNF ii) CNF. 7
 (c) Convert the following expression into DNF : $(p \rightarrow (q \wedge r)) \wedge (\neg p \rightarrow (\neg q \wedge \neg r))$. 4
3. (a) State which rule of inference is used in the argument:
 If it rains today, then we will not have a barbecue today. If we do not have a barbecue today, then we will have a barbecue tomorrow. Therefore, if it rains today, then we will have a barbecue tomorrow. 6 7
 (b) State which rule of inference is the basis of the following argument: "It is below freezing and raining now. Therefore, it is below freezing now". 6 5
 (c) Define direct proof and indirect proof with example. 4
 (d) Show that if n is a positive integer, then $1+2+3+\dots+n = n(n+1)/2$. 5
4. (a) What are floor, ceiling and hashing function?. 2 3
 (b) Define with proper example i) function ii) ONE-TO-ONE function iii) ONTO function. 3
 (c) Define Relation. Discuss the following properties of relation. i) Reflexive ii) Symmetric 5
 iii) transitive. ✓ 3
 (d) Define group and semi group. 4
5. (a) Use the bubble sort to put 3, 2, 4, 1, 5 into increasing order. 6
 (b) Find the greatest common divisor of 414 and 662 using Euclidean algorithm and also write the pseudo code of this algorithm. 6
 (c) What do you mean by law of detachment?. 3
6. (a) Discuss the method of bisection to find an approximate root of an equation $f(x) = 0$. 5
 (b) Find a real root of the equation $x^3 - 2x^2 - 4 = 0$ using false position method. 5
 (c) Derive Newton-Raphson's iterative method to find an approximate root of an equation $f(x) = 0$. 5
7. (a) Explain interpolation and extrapolation with example. ✓ 5
 (b) Derive Newton's forward difference interpolation formula. ✓ 3 5
 (c) Derive Lagrange's interpolation formula for unequal intervals. ✓ 5
8. (a) Explain trapezoidal rule of numerical integration ✓ 4
 (b) Derive Simpson's 1/3 rule using the method of undetermined coefficients. 5
 (c) Explain the equation of solution by Taylor's series. ✓ 6

Dept. of Computer Science and Engineering

Second Year B.Sc. (Honours) Final Examination-2013

Course No. CSE 203

Course Title: Discrete Mathematics and Numerical Methods

Full Marks: 75

Time: 04 Hours

(Answer any five questions)

1. a) Define Proposition. What do you mean by converse and contrapositive of $p \rightarrow q$. 3
 b) Show that $(\neg q \wedge (p \rightarrow q)) \rightarrow \neg p$ is a tautology. 3
 c) State the converse, contrapositive and inverse of each of these implications. 4
 i) If it snows tonight, then I will stay at home.
 ii) I go to the beach whenever it is a sunny summer day.
 iii) When I stay up late, it is necessary that I sleep until noon.
 d) What is the cardinality of a null set \emptyset ? 1
 e) Explain conjunction and disjunction operations of propositions. 4
2. a) Define Predicates and Quantifiers. 2
 b) Define free and bound variable with example. 3
 c) Explain the following rules of inference i) Universal Instantiation ii) Universal Generalization iii) Existential instantiation iv) Existential Generalization. 8
 d) Let $Q(x, y)$ denote the statement " $x=y+3$ ". What are the truth values of the propositions $Q(1, 2), Q(3, 0)$? 2
3. a) What do you mean by the notation $a \equiv b \pmod{m}$? 2
 b) Explain the concept of Mathematical Induction. 5
 c) Use mathematical induction to prove that if n is a positive integer, then $1+2+3+\dots+n=n(n+1)/2$. 5
 d) Find the greatest common divisor of 414 and 662 using Euclidean Algorithms. 3
4. a) Define ONE -TO-ONE and ONTO functions with example. 5
 b) Explain Inverse functions and Composition of functions. 5
 c) Let g be the function from the set $\{a,b,c\}$ to itself such that $g(a)=b, g(b)=c$ and $g(c)=a$. Let f be the function from the set $\{a,b,c\}$ to the set $\{1,2,3\}$ such that $f(a)=3, f(b)=2$ and $f(c)=1$. What is the composition of f and g and what is the composition of g and f . 5
5. a) Define Reflexive, Symmetric, Antisymmetric and Transitive relation. 4
 b) Let R be the relation $\{(1,2),(1,3),(2,3),(2,4),(3,1)\}$ and Let S be the relation $\{(2,1),(3,1),(3,2),(4,2)\}$. Find SoR. 2
 c) How many reflexive relations are there on a set with n elements? ${}^n \times (n-1)$ 2
 d) Define group and semigroup. 4
 e) Explain digraph. 3
6. a) Show that Newton Raphson method has quadratic convergence. 6
 b) Use Newton-Raphson method to find a root of $x^3 - 2x - 5 = 0$. 5
 c) Explain the general formula of Newton Raphson. 4
7. a) From the following values of x and y , find $\frac{dy}{dx}$, when $x=6$: 5

x	4.5	5.0	5.5	6.0	6.5	7.0	7.5
y	9.69	12.90	16.71	21.18	26.37	32.34	39.15

 b) Evaluate $\int_1^3 \frac{1}{x} dx$ by Simpson's rule with 4 strips. Determine the error by direct integration. 5
 c) Evaluate $\int_1^3 \frac{1}{x} dx$ by Simpson's rule with strips. 5
8. a) Derive error in lagrangian interpolation formula. 6
 b) Define interpolation and extrapolation. 4
 c) Develop Simpson's 1/3 rules of numerical integration. 5

B.Sc(Hons)-Second Year-Final Examination-2012
 Department of Computer Science and Engineering
 Course no : CSE-203.

Course Name : Discrete Mathematics and Numerical Methods
 Islamic University, Kushtia,

Full marks : 75

Time : 4 Hours

- 1.a)** Define proposition. What are the contra positive, converse and inverse of $P \rightarrow Q$? 5
- b)** Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. 3
- c)** Show that $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent. 3
- d)** Define implication. Express the English sentence " You can access the internet from campus only if you are a computer science major or you are not a fresh man" into a logical expression. 4
- 2.a)** Define universe of discourse, existential quantification and universal quantification. 6
- b)** Let $Q(x,y)$ denote the statement " $x=y+3$ ". What are the truth value of the propositions $Q(1,2)$ and $Q(3,0)$? 2
- c)** What is the truth value of $\forall x P(x)$, where $P(x)$ is the statement " $x^2 < 10$ " and the domain longist of the positive integers not exceeding 4? 3
- d)** Translate the following statement $\exists x \forall y \forall z ((F(x,y) \wedge F(x,z)) \rightarrow \neg F(y,z))$ into English. Where $F(a,b)$ means a and b are friends and the domain for x,y and z consists of all students in your university. 4
- 3.a)** Explain the following rules of inference : i) Universal instantiation , ii) Universal generalization, iii) Existential instantiation , iv) Existential generalization. 8
- b)** Define pseudorandom numbers and Big-O-notation. 3
- c)** Use the bubble sort to put 3,2,4,1,5 into increasing order. 4
- d.a)** Define forward and backward reasoning. 4
- b)** Use mathematical induction to show that $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$ for all nonnegative integers n. 5
- c)** What is the greatest common divisor of 17 and 22? 2
- d)** Let $a = bq+r$, where a,b,q and r are integer. Then prove that $\gcd(a,b) = \gcd(b,r)$. 4
- 4.a)** Define symmetric and anti symmetric relation. 4
- b)** How many relations are there in a set with n elements. 2
- c)** Consider the following relations on $\{1,2,3,4\}$:
 $R_1 = \{(1,1),(1,2),(2,1),(2,2),(3,4),(4,1),(4,4)\}$.
 $R_2 = \{(1,1),(1,2),(2,1)\}$.
 $R_3 = \{(1,1),(1,2),(1,4),(2,1),(2,2),(3,3),(4,1),(4,3)\}$.
 $R_4 = \{(2,1),(3,1),(3,2),(4,1),(4,2),(4,3)\}$.
 $R_5 = \{(1,1),(1,2),(1,3),(1,4),(2,2),(2,3),(2,4),(3,3),(3,4),(4,4)\}$.
 $R_6 = \{(3,4)\}$. Which of these relations are reflexive ? 4
- d)** Define digraph. 2
- 5.a)** Show that Newton Raphson method has quadratic convergence. 6
- b)** Use the Newton Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$. 5
- c)** Explain the general formula of Newton Raphson. 4
- 6.a)** Derive error in language's interpolation formula. 6
- b)** Define interpolation and enterpolation. 4
- c)** If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y_n = 7$. Find x. 5
- 7.a)** Develop simpson's 1/3 rules of numerical integration. 5
- b)** Using the rule evaluate $I = \int_0^1 (5 - 3 \sin 2x) dx$ correct to three decimal places with $n=0.25$. 6
- c)** Integrate $5x^3 - 3x^2 + 2x + 1$ from $x=-1$ to $x=1$ using simpson's rule with $n=1$. 4