

Hajee Mohammad Danesh Science and Technology University, Dinajpur
 Mid Semester Examination 2008
 Course Title: Algorithm Analysis and Design
 Course Code: CIT- 205 Course Credit: 3
 Full Marks: 30 Time: 50 minutes
 [Answer any two questions]

1. (a) What is an algorithm? Explain the term "Algorithm is a technology". 4
- (b) Define Time and space complexity. 3
- (c) Write a recurrence for the running time $T(n)$ of $function(n)$, and solve that recurrence. Assume that addition can be done in constant time. 4

$function(n) \rightarrow T(n)$

```

    {
        if (n == 1)      ;
            return 1;
        else           ;
            return f(n-1)+f(n-1);
    }
  
```

$$= 2T(n-1) + 1$$

- (d) Is $2^{n+1}=O(2^n)$? Is $2^{2n}=O(2^n)$? 2
 - (e) When is insertion sort algorithm better than merge sort algorithm? Why? 2
 - 2.(a) Differentiate between divide and conquer dynamic programming design techniques. 2.5
 - (b) What is the optimal substructure of an LCS? Find out the recursive formula it gives. 4.5
 - (c) Find the recursion tree for the computation of RECURSIVE_MATRIX_CHAIN(p,1,3). 5
 - (d) Argue that in the best case, quick sort runs in $\Omega(n \log n)$ time. 3
- 3.(a) Illustrate the operation of HEAPSORT on the array A=(5,13,2,25,7,17,20,8,4) 7
- (b) Solve the following 0/1 knapsack problem using dynamic programming. The knapsack has a weight capacity of 8 units. You are given the following items: 8

Item	A	B	C	D
Profit	2	4	7	10
Weight	1	3	5	7

Show the dynamic programming table, and determine the maximum value that can be achieved along with the selected items.

These differences.

What is a loop invariant? How can loop invariants help in proving the

3

Hajee Mohammad Danesh Science and Technology University, Dinajpur
 B.Sc. (Engineering) in CSE

Semester Final Examination 2021 (June-December)
 Level 2 Semester II, Course Code: CSE 255, Credit: 3
 Course Title: Algorithm Analysis and Design

Time: 3 hours

Total Marks: 90

NB: Figures in the right margin indicate full marks. Parts of the same question should be answered together and in the same sequence.

Section-A → 27/30

Answer any Three

1. (a) Define an algorithm. List six properties that an algorithm should possess. 3
 - (b) Using Asymptotic notation find the time complexity of following code 3.5

```
int i, j, k = 0;
for (i = n / 2; i <= n; i++)
    for (j = 2; j <= n; j = j * 2)
        k = k + n / 2;
```
 - (c) Draw the recursion tree for $T(n) = T(n/3) + T(2n/3) + cn$, where c is a constant 3.5 and provide an asymptotic bound on its solution.
 - (d) Compare and contrast the time complexity of Quick Sort in its best-case, average-case, and worst-case scenarios, and discuss the factors that contribute to these differences. 5
2. (a) What is a loop invariant? How can loop invariants help in proving the correctness of an algorithm? 3
 - (b) Discuss the key steps involved in designing a Divide and Conquer algorithm. How does the problem get divided, and how are the subproblem solutions combined? Answer the question considering Merge sort algorithm. 5/3
 - (c) Construct an optimal Huffman coding tree for the characters I with frequency 75, U with frequency 200, B with frequency 25, S with frequency 275, C with frequency 60, H with frequency 100, M with frequency 25, and P with frequency 250. 7/5
- I - 75
 U - 200
 B - 25
 S - 275
 - 50
 - 100
 - 25
 - 250
3. (a) Describe the design paradigm of Dynamical Programming. Which problem does it address? In which situations can it be used? 4/3
- (b) Given the five matrices below, using dynamic programming find a full parenthesization of $A_1 : : : ; A_5$ with minimum multiplication complexity. 9/3

Matrix Dimension

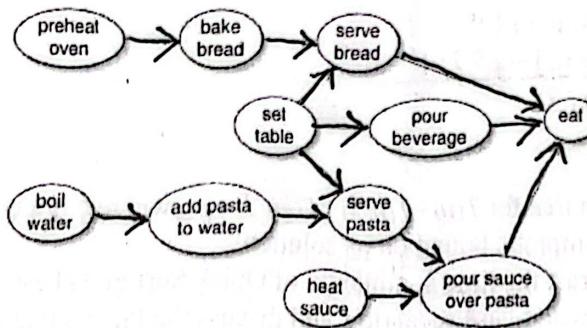
A1	<u>3 x 2</u>
A2	<u>2 x 5</u>
A3	<u>5 x 2</u>
A4	<u>2 x 4</u>
A5	<u>4 x 1</u>

- (c) Define Principle of optimality. 2/1

- (a) Explain why algorithms are frequently described as a form of technology? 3/2
- (b) Determine an LCS of (GATTACA) and (GTAATCTAAC) using dynamic algorithm. 7/6
- (c) Explain the knapsack problem and its variations. Discuss the difference between the 0/1 knapsack problem and the fractional knapsack problem. Provide examples to illustrate each variation. 5/4

Section B Answer any Three

1. (a) Define topological sort and explain its significance in directed acyclic graphs (DAGs). Using topological sort algorithm find out the topological order of the following nodes. 2/8



- (b) Explain how the Breadth-First Search (BFS) algorithm can be used to find the shortest path between two nodes in an unweighted graph. 5

2. (a) Draw the simple weighted graph $G = (V; E; w)$, where the edges/weights are given by 10

$$E = \{(a; b; 1); (a; c; 3); (b; c; 3); (c; d; 6); (b; e; 4); (c; e; 5); (d; f; 4); (d; g; 4); (e; g; 5); (f; g; 2); (f; h; 1); (g; h; 2)\}$$

Use Prim's algorithm to find a minimum spanning tree for the graph. Do the same using Kruskal's algorithm.

- (b) What is the significance of the priority queue in Dijkstra's algorithm? How is it used to select the next vertex with the shortest distance? Analyze the time and space complexity of Dijkstra's algorithm. 5

3. (a) How is the negative-weight cycle avoided in Bellman-Ford algorithm? 3/1

- (b) Provide a step-by-step illustration of how the HEAPSORT algorithm operates on the array $A = (5, 13, 2, 25, 7, 17, 20)$. 6/5

- (c) Describe the Greedy algorithm approach to solve the Activity Selection Problem. Analyze the time complexity of the Activity Selection Problem. 4+2/4

4. (a) What is backtracking? Find out all possible solution spaces of 4-queens problems using backtracking method. 1+6/5

- (b) Describe the relationship between the classes P and NP. Is every problem in P also in NP? Justify your answer. 1+2/2

- (c) Design an algorithm to sort a list of integers in ascending order using the insertion sort technique. Analyze the time complexity of your algorithm. 5/3

To C LAB

Construct a Mealy Machine that prints '1' whenever the sequence 'aa' or 'bb' is encountered in any input binary string from Σ^* where $\Sigma = \{a, b\}$. Design the equivalent Moore Machine for it.

1. Let G be the grammar:

$$S \rightarrow aB|bA, A \rightarrow a|aS|bAA, B \rightarrow b|bS|aBB$$

For the string aabbaabba find i) leftmost derivation, ii) parse tree, and iii) Is the grammar ambiguous?

2. Find the regular expressions for each of the following languages over the alphabet {0, 1}.

(vi) The set of strings that have at least one 1.

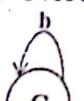
(vii) All strings containing an even number of 0's.

(viii) All strings containing at least two 0s and at least one 1.

(ix) All strings containing the substring 000.

(x) All strings in which every run of 0s has length at least 3.

3. Minimize the following DFA using Myhill -Nerode theorem.



Department of Computer Science and Engineering
 B.Sc. (Engineering) in Computer Science and Engineering
 Level: 2 Semester: II, Course Code: CSE 258, Credit: 1.5
 Course Title: Theory of Computation and Concrete Mathematics

- Let G be the grammar:

$$S \rightarrow aB|bA, A \rightarrow a|aS|bAA, B \rightarrow b|bS|aBB$$

For the string aabbaabba find i) leftmost derivation, ii) parse tree, and iii) Is the grammar ambiguous?

- Find the regular expressions for each of the following languages over the alphabet {0, 1}.

(vi) The set of strings that have at least one 1.

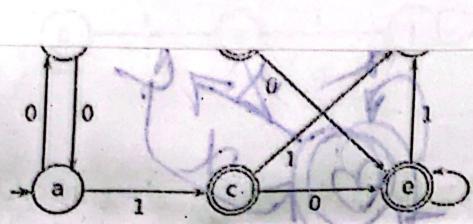
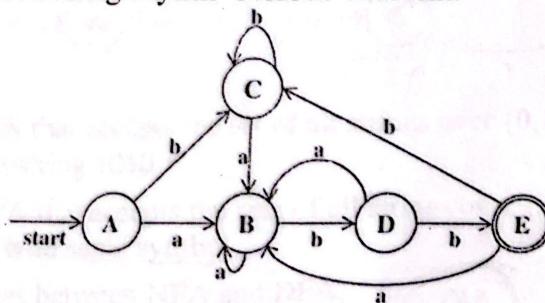
(vii) All strings containing an even number of 0's.

(viii) All strings containing at least two 0s and at least one 1.

(ix) All strings containing the substring 000.

(x) All strings in which every run of 0s has length at least 3.

- Minimize the following DFA using Myhill -Nerode theorem.



- Convert the following Mealy machine into its equivalent Moore machine.

Present	$I/P=0$	$I/P=1$
---------	---------	---------

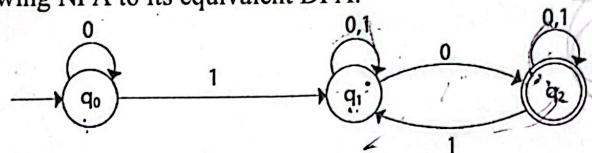
[N.B. The figure in the right margin indicates the marks allocated for the respective question.]

The split answer to any question is not allowed.]

(Answer any 03(three) from the following questions)

1. a) Define Finite State Automata (FA). Differentiate the + closure and * closure. 2+3

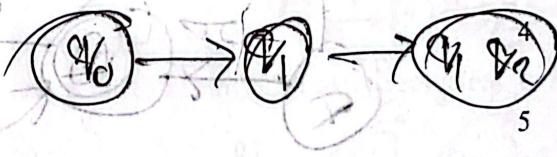
- b) Convert the following NFA to its equivalent DFA. 5



2. a) Construct a DFA that accepts the set of all strings over {0,1}, where each string contains the substring 1010. 3+3

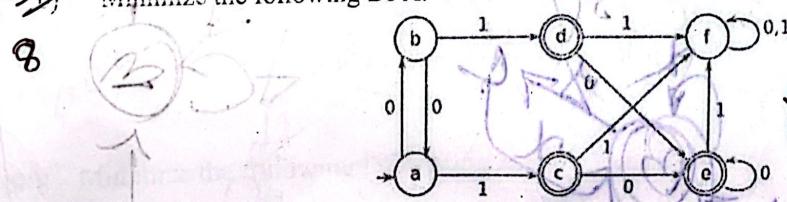
- b) Construct a DFA that accepts the sets of all strings over {x, y}, where each string starts and ends with same symbol. 5

- b) Write the differences between NFA and DFA. 5



3. a) Briefly explain Arden's theorem. 5

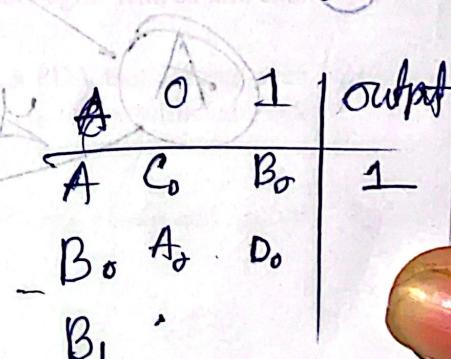
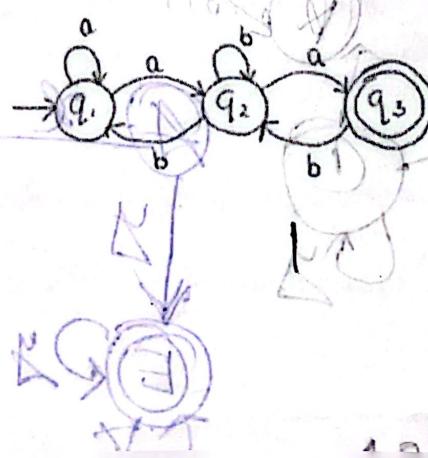
- b) Minimize the following DFA. 5



4. a) Convert the following Mealy machine into its equivalent Moore machine. 5

Present State	I/P=0		I/P=1	
	Next State	O/P	Next State	O/P
→ A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

- b) Find the regular expression for the following NFA. 5

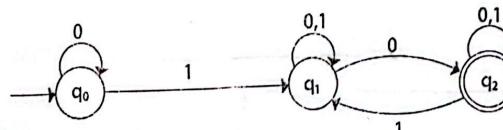


[N.B. The figure in the right margin indicates the marks allocated for the respective question. The split answer to any question is not allowed.]

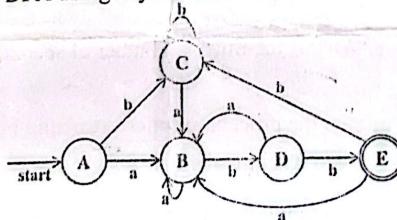
Section-A 22/38

(Answer any 03(three) from the following questions)

1. a) Explain finite automata. Differentiate the + closure and * closure. 3+2
 b) i. Design a FA which accepts odd number of 1's and any number of 0's. 5x2=10
 ii. Design a FA to accept the string that always ends with 00.
 iii. Construct a DFA that accepts the set of all strings over {0,1}, where each string contains the substring 1010.
 iv. Construct a DFA that accepts the sets of all strings over {x, y}, where each string starts and ends with the same symbol.
 v. Construct DFA that accepts input string of 0's and 1's that end with 11.
2. Define: (i) String (ii) Alphabet (iii) Cardinality (iv) Language
3. Write the differences between NFA and DFA. Convert the following NFA to its equivalent DFA.

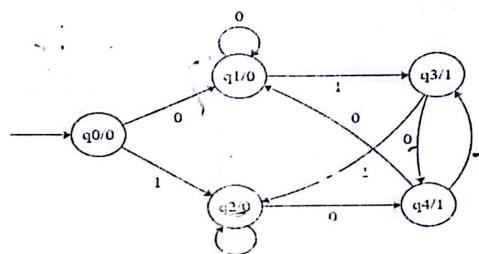


- (c) Minimize the following DFA using Myhill-Nerode theorem. 5



3. a) Define regular expression with its applications.
 b) Design a NFA that accept the strings over the alphabets {0,1} that begins with 01 and ends with 11. Check for the validity of 01111 and 0110 strings. 5
 c) Give the formal definition of Pushdown Automata. Construct a PDA that accepts even palindromes of the form $L = \{ww^R | w = (a+b)^*\}$. Demonstrate the constructed PDA with an example. 2+2+3

4. a) Explain "finite state machines with outputs". Discriminate between Mealy and Moore machines. 2+2
 b) Convert the Moore machine to its equivalent Mealy machine. 5



- c) Construct a Mealy Machine that prints '1' whenever the sequence 'aa' or 'bb' is encountered in any input binary string from Σ^* where $\Sigma = \{a, b\}$. Design the equivalent Moore Machine for it. 2+4

Section-B

15/30

(Answer any 3(three) from the following questions)

1. a) Define regular expression. Convert the given regular expression $(a|b)^*abb$ to a NFA then a DFA. 1+3+3

- b) Show that $(1+00^*1)+(1+00^*1)(0+10^*1)^*(0+10^*1)=0^*1(0+10^*1)^*$ 3

- c) Find the regular expressions for each of the following languages over the alphabet {0, 1}. 5

- (i) The set of strings that have at least one 1. $0^*10^* (0^*10^*)^*$
- (ii) All strings containing an even number of 0's. $(1^*01^*01^*)^+$
- (iii) All strings containing at least two 0s and at least one 1.
- (iv) All strings containing the substring 000.
- (v) All strings in which every run of 0s has length at least 3. $(0+1)^*000(0+1)^*$

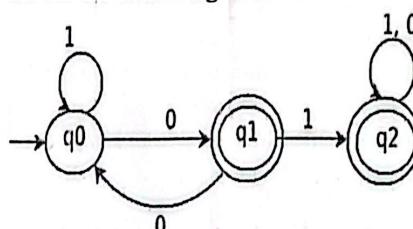
2. a) Convert the following grammar into Chomsky's normal form. 5

$$S \rightarrow AaB|b$$

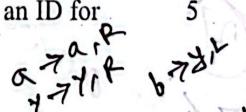
$$A \rightarrow S | \epsilon | AB$$

$$B \rightarrow bbb|ASA$$

Find the regular expression for the following DFA.



Construct a Turing machine that recognizes the language $L=\{a^n b^n, n \geq 1\}$. Show an ID for the string 'aaabbb' with tape symbols. 5



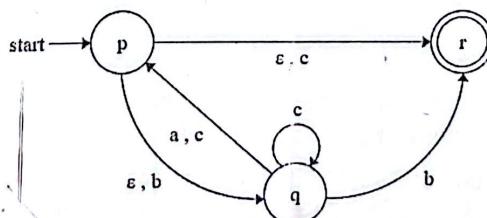
3. a) What is concrete mathematics? How it differs from discrete mathematics? 2+2

b) What is Josephus problem? How do we solve the Josephus problem? Explain. 6

c) Define Stirling numbers. What is the Stirling number of second kind? Explain. 2+3

4. a) What is a parse tree? Describe the procedure for constructing parse tree. 2+3

b) Convert the following ϵ NFA to its equivalent NFA. 5



Consider the grammar $S \rightarrow aS \mid aSbS \mid \epsilon$. This grammar is ambiguous. Show that the string "aab" has two: 2+1.5 +1.5

- i) Parse trees
- ii) Leftmost derivations
- iii) Rightmost derivations

(ϵ^+)

a ϵ

Hajee Mohammad Danesh Science and Technology University, Dinajpur

Department of Computer Science and Engineering

Mid Term Examination 2021 (Jul-Dec)

B.Sc. (Engineering) in CSE

Level 2 Semester II, Course Code: CSE 259, Credit: 3.0

Course Title: Computer Architecture and Organization

Time: 50 Minutes

Total Marks: 30

1. What is the advantage of using Carry Save adder? Add the three numbers 111, 011 and 101 using Carry Save adder. 10
2. Compare Fixed Point and Floating Point numbers. Show any condition with a diagram that causes pipeline hazard. 10
3. Given that a 16 byte memory with a 4 byte cache (2 blocks). Explain with diagram and calculation that memory addresses 8 and 13 would be mapped into which cache line/block using Direct Mapping approach. 10
4. Compute the average among _____, _____, and _____. 1
5. In an isolated I/O with 4 address lines there are _____ addresses. 1

Compute the processor time T, if the number of machine language instructions a program requires to execute is 15, and the average number of steps a machine language instruction requires to execute is 3. The clock rate is 2 GHz.

Write the functionalities of different types of CPU registers. 5

Draw the diagram of an instruction cycle. Which addressing mode is used to represent constants? Give an example. 2+3

Pipeline performance is determined by $\tau = \max[\tau_i] + d = \tau_m + d$ $1 \leq i \leq k$. What does each parameter indicate? Are pipelining and parallel processing the same? 3+2

Hajee Mohammad Danesh Science and Technology University, Dinajpur

Department of Computer Science and Engineering

B.Sc. (Engineering) in CSE

Quiz#2 2021 (Jul-Dec)

Level 2 Semester II, Course Code: CSE 259, Credit: 3.0

Course Title: Computer Architecture and Organization

Time: 20 Minutes

Marks: 10

What is the other name for out-of-order execution? Do super scalar execution and out-of-order execution mean the same?

1+2

Give an example of register renaming.

1.5

A control word is a microinstruction. True/False.

1

Hardwired control unit generates a sequence of instructions. True/False.

1

Micro program counter is used to _____.

1

I/O controllers play as a bridge among _____, _____, and _____.

1.5

In an isolated I/O with 4 address lines there are _____ addresses.

1

Time = $\frac{\text{number of machine language instructions}}{\text{average number of steps per instruction}}$, if the number of machine language instructions a program requires to execute is 15, and the average number of steps a machine language instruction requires to execute is 3. The clock rate is 2 GHz.

FULL Ans.

Hajee Mohammad Danesh Science and Technology University, Dinajpur
Department of Computer Science and Engineering
Semester Final Examination 2021
B.Sc. (Engineering) in CSE
Level 2 Semester II, Course Code: CSE 259, Credit: 3.0
Course Title: Computer Architecture and Organization

Time: 3 Hours

Total Marks: 90

Section A

Answer any THREE

1. a) Compare between computer architecture and computer organization. Why was assembly language introduced? 3+2

b) Write about system bus. 5

2. a) What is the most important measure to compute the performance of a computer?
Compute the processor time T , if the number of machine language instructions a program requires to execute is 15, and the average number of steps a machine language instruction requires to execute is 3. The clock rate is 2 GHz. 2+3

3. a) Write the functionalities of different types of CPU registers. 5

b) Draw the diagram of an instruction cycle. Which addressing mode is used to represent constants? Give an example. 2+3

c) Pipeline performance is determined by $\tau = \max[\tau_i] + d = \tau_m + d$ $1 \leq i \leq k$. What does each parameter indicate? Are pipelining and parallel processing the same? Explain. 3+2

4. a) What is the benefit of carry save adder? Why does carry look ahead become excessively complicated for long numbers? 2+3

b) Explain with an example, what happens in multiplication, if multiplicand is negative and multiplier is positive. 5

c) Divide 7 by 2 using restoring division. 5

4. a) What is fixed point number? Show floating point number representation. 2+3

b) How does instruction hazard occur? Give an example. 2+3

c) Show how data flows in systolic array in a 3×3 matrix multiplication? Write down the applications of systolic array. 2+3

Section B

Answer any THREE

1.
 - a) What does a cache memory hold? Draw the flowchart of a cache read operation. 2+3
 - b) What is memory mapping? Why is memory mapping needed? 2+3
 - c) Explain how associative memory mapping works. 5
2.
 - a) Write the steps to execute instructions using out-of-order approach. 5
 - b) Write any instructions that show memory disambiguation and explain it. 5
 - c) What is duplication of resources in register renaming? 5
3.
 - a) What is the limitation of the programmed I/O method? Why is isolated I/O called so? 2+3
 - b) If multiple interrupts occur, how does the processor determine which one to process? 5
 - c) Write the two approaches of bus arbitration. 5
4. Write short note on any two of the followings: 7.5x2
 - i. Super Scalar Execution
 - ii. Direct Memory Access
 - iii. Von Neumann Architecture

Course Code: ACT 205

Full Marks: 60 (30+30)

Credit Hour: 2

Time: 2 Hours

The figures in the right margin indicate the marks for respective questions. Each part of a question, if any,
should be answered sequentially.

USE SEPARATE SCRIPT FOR ANSWERING EACH SECTION

SECTION # A

Answer any two

1. (a) Differentiate between event and transaction. 2
 - (b) Illustrate the accounting equation. 1
 - (c) Who are the users of accounting information? 2
 - (d) Differentiate between financial accounting and managerial accounting. 3
- 15
2. HP Ltd. is established on 1st February 2021. On 28th February 2021 the balance sheet showed the balance of Cash Tk. 5,20,000, Accounts Receivable Tk. 80,000, Supplies Tk. 70,000, Accounts Payable Tk. 90,000, Loan Tk. 1,80,000 and Capital Tk. 4,00,000. A summary of March transactions is presented below.

- March 1 Paid Tk. 50,000 for accounts payables due.
3 Received Tk. 30,000 from accounts receivables.
5 Paid Tk. 25,000 for loan.
6 Make a rental agreement for the office premises @ Tk. 15,000 per month.
7 Signed a deed for completing a service with Rupali Bank Ltd. amounting Tk. 3,00,000.
8 Additional investment made by owners Tk. 5,10,000 in cash.
10 Incurred advertising expenses on account to "The Daily Sun" amounting Tk. 40,000.
12 Make a contract with raw materials suppliers for Tk. 5,00,000.
13 Purchased supplies amounting Tk. 75,000 on account.
15 Purchased furniture of Tk. 4,00,000; of which Tk. 2,50,000 is paid in cash.
16 Revenue recognized Tk. 8,00,000; of which Tk. 5,00,000 is received in cash.
18 Appointed an employee for the office @ Tk. 30,000 salary per month.
19 Paid Tk. 50,000 for office rents and Tk. 90,000 for salaries in cash.
20 Received Tk. 3,50,000 on notes payable.
22 Drawing made by owners Tk. 1,10,000 in cash for personal use.
24 Paid Tk. 2,00,000 for notes payable due.
28 Got a proposal from 'Reliance Group' of Tk. 4,00,000 for software development.

You are required to prepare tabular analysis of the March transactions. The column headings should be as:

$$\begin{array}{l} \text{Assets} = \text{Liabilities} + \text{Owners' Equity} \\ \text{Cash} + \text{Accounts Receivable} + \text{Supplies} + \text{Furniture} = \text{Accounts Payable} + \text{Loan} + \text{Notes Payable} + \text{Capital} + \text{Revenues} - \text{Expenses} - \text{Drawing} \end{array}$$

3. Following is the particulars of Nokia Corporations for the year ended December 31, 2021.

Particulars	Tk.
Revenues (25,000 units)	380 per unit
Variable expenses	250 per unit
Fixed expenses	20,00,000

- (a) Prepare the contribution format income statement.
(b) Compute the company's CM ratio, variable expenses ratio, and yearly break-even point in units and in Taka sales, company's margin of safety in both taka and percentage form and company's degree of operating leverage at the present level of sales. (2.6)
(c) If sales price increased to Tk. 450 and variable expense increased to Tk. 300 per unit and fixed expense remained constants, if you want to earn a target profit of Tk. 15,00,000, how many units would have to be sold in each year to do that?

12,500
23,333

SECTION # B
Answer any two

1. Following is the trial balance of Tencent Corporation for the year ended December 31, 2021.

Sl.	Particulars	Ref.	Debit (Tk.)	Credit (Tk.)
X 1.	Capital			25,00,000
2.	Commission received			2,00,000
3.	Interest paid		62,000	
4.	Rents receivables		37,000	
5.	Rents revenues			1,50,000
6.	IT Equipment's		4,90,000	
7.	Cash at bank		1,45,000	
8.	Income from other sources			75,000
9.	Gain on sale of old assets			25,000
10.	Investment		7,20,000	
11.	Drawings		1,43,000	
12.	Bank overdraft			1,75,000
13.	Service revenues			4,80,000
14.	Bills payable			35,000
15.	Bills receivables		1,83,000	
16.	Office expenses		28,000	
17.	Others received			95,000
18.	Prepaid Insurance		55,000	
19.	Utilities payable			27,000
20.	Land and building		18,99,000	
	Total		37,62,000	37,62,000

Prepare income statement, owners' equity statement and balance sheet.

2. From the following information of Ericsson Inc. Ltd. for the year ended 31st December:

Particulars	2020	2021
Revenues	Tk. 70,00,000	90,00,000
Operating expenses	5,00,000	7,00,000
Non-operating income	1,35,000	1,25,000
Investment	60,00,000	70,00,000
Net operating income	7,50,000	10,00,000
Minimum required rate of return	5%	5.5%

- (a) Calculate margin, turnover and ROI and the residual income for the both years. 10
 (b) In which year company is doing better? Why? 05

3. Following is the particulars of Siemens Corporation., for the year ended December 31, 2021. 15

As on December 31st 2020: Stock of raw materials Tk. 50,000 Work- in – progress Tk. 20,000 and Stock of finished goods Tk. 70,000.

As on December 31st 2021: Stock of raw materials Tk. 70,000. Work- in – progress Tk. 50,000 and Stock of finished goods Tk. 1,00,000.

Particulars	Tk.	Particulars	Tk.
Direct wages	1,75,000	Direct expenses	1,32,000
Indirect wages	25,000	Indirect expenses	32,000
Purchase of raw materials	4,75,000	Bank charges	4,500
Indirect materials	75,000	Insurance for factory	7,800
Bad debts	35,000	Advertisement	45,000
Depreciation of office building	15,000	Depreciation of plant and machineries	17,000
Salary to office staff	1,10,000	Salesman commission	3,500
Salary to factory staff	1,30,000	Sales	15,00,000
Salary to sales staff	1,20,000	Factory power	8,200
Factory fuel	13,000	Office rent	65,000
Factory rent	33,000	Rent of showroom	16,000
Carriage inwards	7,500	Factory stationary	4,500
Distribution expenses	85,000	Accounting fees	4,300
Sundry factory expenses	12,000	Audit fees	38,000

Prepare a cost statement.

14,50,000
6,15,000

1.167 1.286
12.49 14.29

Hajee Mohammad Danesh Science and Technology University, Dinajpur.
 B.Sc. (Engineering) in CSE, Level 2 Semester II (July- December) 2021
 Mid Semester Examination

Course Code: ACT 205, Course Title: Financial and Managerial Accounting

Time: 50 Minutes (Answer any two) Total Marks: 20

1. (a) Differentiate between event and transaction. 3
 (b) Define accounting information. Who are the users of accounting information? 4
 (c) Illustrate the accounting equation. 3
2. Following is the particulars of HP IT Ltd. for the year ended December 31, 2021. 10

Particulars	Tk.
Revenues (1,500 units)	2,500 per unit
Variable expenses	1,600 per unit
Fixed expenses	10,00,000

Requirements:

- i. Prepare the contribution format income statement.
 - ii. Compute the company's CM ratio, variable expenses ratio, break-even point in units and in Taka sales, company's margin of safety in both taka and percentage form and company's degree of operating leverage at the present level of sales.
 - iii. If you want to earn a target profit of Tk. 8,00,000, how many units would have to be sold in each year to do that?
3. following is the information of Dell IT Ltd. and Smart IT Ltd. for the year 2022: 10

Particulars	Dell IT Ltd. (Tk.)	Smart IT Ltd. (Tk.)
Annual Revenues \rightarrow	50,00,000	75,00,000
Net operating income \rightarrow	6,25,000	8,00,000
Operating Expenses \times	12,02,000	14,05,000
Annual Investment \rightarrow	25,00,000	40,00,000
Minimum required rate of return	7.50%	9.50%

Requirements:

- i. Calculate margin, turnover and ROI and the residual income of both companies.
- ii. Which company is good for investment? Why?

Hajee Mohammad Danesh Science and Technology University, Dinajpur.
B.Sc. (Engineering) in CSE, Level 2 Semester II (July- December) 2021
Course Code: ACT 205, Course Title: Financial and Managerial Accounting

Time: 30 Minutes (2nd Quiz Test) Total Marks: 05

Following is the trial balance of Sigma IT Ltd. for the year ended December 31, 2022.

Sl.	Particulars	Ref.	Debit (Tk.)	Credit (Tk.)
1.	Capital			15,00,000
2.	Supplies		60,000	
3.	Commission received			1,00,000
4.	Interest received			75,000
5.	Rents revenues			1,25,000
6.	Furniture and fixtures		5,00,000	
7.	Machineries		2,45,000	
8.	Cash		1,55,000	
9.	Bank balance		1,60,000	
10.	Gain on sale of old assets			35,000
11.	Investment A		4,00,000	
12.	Drawings		1,40,000	
13.	Loss on sale of old assets		1,15,000	
14.	Service revenues			2,25,000
15.	Bills receivable A		1,30,000	
16.	Trade payable			1,35,000
17.	Office expenses		55,000	
18.	Salaries expenses		1,55,000	
19.	Others received			65,000
20.	Advanced salary		85,000	
21.	Depreciation E		1,00,000	
22.	Utilities Payable			40,000
Total			23,00,000	23,00,000

Prepare income statement, owners' equity statement and balance sheet.

Hajee Mohammad Danesh Science and Technology University, Dinajpur.
B.Sc. (Engineering) in CSE, Level 2 Semester II (July- December) 2021
Course Code: ACT 205, Course Title: Financial and Managerial Accounting

Time: 30 Minutes

(1st quiz test)

Total Marks: 05

Alpha IT Ltd. is established on 1st May 2022. On 31th May 2022 the balance sheet showed the balance of Cash Tk. 1,20,000, Accounts Receivable Tk. 80,000, Supplies Tk. 50,000, Bank Loan Tk. 75,000, and Capital Tk. 1,75,000. A summary of June transactions is presented below.

- June 01 Paid Tk. 75,000 for bank loan.
05 Received cash Tk. 50,000 from accounts receivables.
07 Paid Tk. 40,000 cash for salaries
08 Make a rental agreement of office @ Tk. 25,000 per month. ✗
10 Got a proposal from 'Reliance Group' of Tk. 5,00,000 for software development. ✗
12 Additional investment made by owners Tk. 20,00,000 in cash.
15 Signed a deed for supplying items to Rupali Bank Ltd. amounting Tk. 2,00,000. ✗
14 Purchased IT Equipment of Tk. 4,00,000; of which Tk. 2,50,000 is paid in cash.
15 Revenue recognized Tk. 5,00,000; of which Tk. 3,00,000 is received in cash.
16 Incurred advertising expenses on account Tk. 50,000.
17 Made a contract of purchasing supplies of Tk. 3,00,000 from a suppliers with low rate. ✗
18 Hired an employee for the office @ Tk. 25,000 salary per month. ✗
20 Received Tk. 4,00,000 as bank loan.
22 Purchased supplies amounting Tk. 1,50,000 on account.
25 Drawing made by owners Tk. 2,00,000 in cash for personal use.

You are required to prepare tabular analysis of the June transactions. The column headings should be as:

$$\begin{array}{ccc} \text{Assets} & = & \text{Liabilities} & + & \text{Owners' Equity} \\ \text{Cash} + \text{Accounts Receivable} + \text{Supplies} + \text{IT Equipment} & = & \text{Accounts Payable} + \text{Bank Loan} & & \text{Capital} + \text{Revenues} - \text{Expenses} - \text{Drawing} \end{array}$$

Hajee Mohammad Danesh Science and Technology University, Dinajpur
Department of Computer Science and Engineering
B. Sc. (Engineering) in Computer Science and Engineering
Level 2 Semester II, Quiz I
Course Code: CSE 259, Credit: 3.0
Course Title: Digital Electronics and Pulse Techniques

Time: 30 minutes

Total Marks: 15

1. Define logic family. Mention the different types of bipolar and unipolar logic families. 5
2. Define the following characteristics of digital ICs. 5

- i. Speed of operation
- ii. Power dissipation
- iii. Fan-out
- iv. Noise immunity
- v. Wired-logic capability

3. Construct and briefly explain the AND logic operation using 2-input RTL NAND gate(s). 5

$$\overline{A} \cdot \overline{B} = \overline{AB}$$

Hajee Mohammad Danesh Science and Technology University, Dinajpur
 Department of Computer Science and Engineering
 B. Sc. (Engineering) in Computer Science and Engineering
 Level 2 Semester II Quiz II
 Course Code: ECE 259, Credit: 3.0
 Course Title: Digital Electronics and Pulse Techniques

Time: 30 minutes

Total Marks: 15

~~1.~~ Consider a 4-bit unipolar weighted-resistor D/A converter with $V(1) = -1V, V(0) = 0V$ and $R_F = 8R$. Obtain the analog output voltage for each of the digital inputs 1010, 0110, 0101, 1100, and 1011.

~~2.~~ Consider a 4-bit sequence 0010 is applied to the input of an R-2R ladder D/A converter circuit. Analyze the circuit step by step for this input sequence and find the output voltage.

~~3.~~ A combinational circuit is defined by the following functions. Implement the circuit with programmable array logic (PAL).

$$F_1(A, B, C) = \sum_m(2, 3, 6, 7)$$

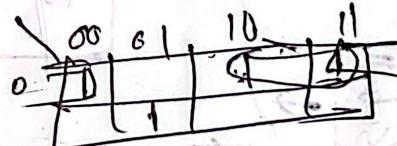
$$F_2(A, B, C) = \sum_m(0, 2, 3, 5)$$

$$F_3(A, B, C) = \sum_m(1, 6, 7)$$

2 1 0 1

D 10

B



A B + A

A B

12/07
 13/07
 14/07
 15/07

10
6
5
12
11

circuits.

- b) Draw a circuit diagram of a parallel positive clipper circuit.

Hajee Mohammad Danesh Science and Technology University, Dinajpur
Department of Electronics and Communication Engineering
B. Sc. (Engineering) in Computer Science and Engineering
Level 2 Semester II, Mid-Term Examination 2021
Course Code: ECE 259, Credit: 3.0
Course Title: Digital Electronics and Pulse Techniques

Time: 50 minutes

Total Marks: 30

1.
 - a) Define linear wave shaping. Name some non-sinusoidal waveforms. 1 1+1=2
 - b) Determine the response of RC high pass filter circuit for the step waveform input and sketch the input-output waveforms. 5 4+2=6
 - c) A 10 Hz symmetrical square wave whose peak-to-peak amplitude is 2V is impressed upon a high-pass circuit whose lower 3-dB frequency is 5Hz. Calculate and sketch the output waveforms. 5 5+2=7
2.
 - a) Determine the complex transfer function of the low pass RC filter circuit and also sketch the frequency response curve of it. 5 4+1=5
 - b) Determine the response of RC low pass filter circuit for the pulse waveform input and sketch the input-output waveform. 5 4+1=5
 - c) Show that low-pass RC circuit can be used as an Integrator. 5 5
3.
 - a) Draw the circuit diagram of 2-input DTL NAND gate and explain its operation. 5 2+3=5
 - b) Draw the circuit diagram of Integrated-Injection Logic (I^2L) inverter and explain its operation. 5 2+3=5
 - c) Draw the circuit diagram of a 2-input CMOS NOR gate and explain its logical operation with mentioning the state of each transistor. 5 2+3=5

MID \rightarrow 20 SWZ \rightarrow 7.5
 ATT \rightarrow 14.5 (12)

$$V_o = \frac{1}{T} \int v_{in} dt$$

Hajee Mohammad Danesh Science and Technology University, Dinajpur
 Department of Electronics and Communication Engineering
 B. Sc. (Engineering) in Computer Science and Engineering
 Level 2 Semester II, Final Examination 2021
 Course Code: ECE 259, Credit: 3.0
 Course Title: Digital Electronics and Pulse Techniques

Time: 3 Hours

Marks: 90

Separated answers to a question is not allowed

Section - A

Answer any three of the following

1. a) Illustrate how digital signal can be represented using positive logic and negative logic systems.
- b) "Semiconductor switches are best suited for digital circuits over relays and mechanical switches"- Justify the statement.
- c) Describe the use of a transistor as a switch.
- d) Define the following characteristics of digital ICs.
 - i. Speed of operation
 - ii. Power dissipation
 - iii. Fan-out
 - iv. Noise immunity
 - v. Wired-logic capability

2

3

5

5x1=5

2. a) Determine the complex transfer function of the low pass RC filter circuit and also sketch the frequency response curve of it.

4+2=6

- b) Consider an ideal $1\ \mu s$ pulse with amplitude of 5 V is fed to a low-pass RC filter and the upper 3-dB frequency of this circuit is $10\ MHz$. Calculate the time constant of the circuit and draw the input output waveforms.
- c) Show that low-pass RC circuit can be used as an Integrator.

2+2=4

5

3. a) Define clipper and clamper. Write some applications of the clipper and clamper circuits.

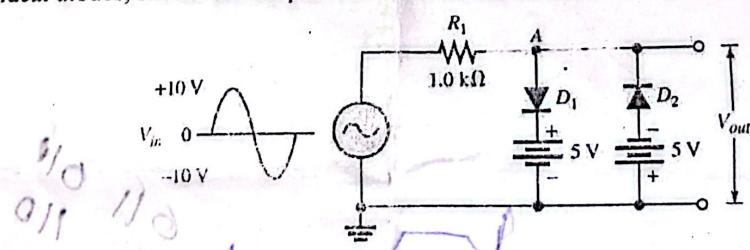
2+3=5

- b) Draw a circuit diagram of a parallel positive clipper circuit with negative reference voltage and sketch the output waveform for a sinusoidal input with peak value $V = +15$ volts, assuming that reference voltage, $V_r = -5$ volts.

3+3=6

- c) A sinusoidal input is applied to the following circuit. Considering D_1 and D_2 as ideal diodes, sketch the output waveform of the circuit.

4



4. a) Draw the circuit diagram of Integrated-Injection Logic (I^2L) inverter and explain its operation.

2+3=5

- b) Draw the circuit diagram of a 2-input CMOS NOR gate and explain its logical operation with mentioning the state of each transistor.

2+3=5

- c) Draw the circuit diagram of 3-input TTL NAND gate and discuss its logical operation with mentioning the state of each transistor.

2+3=5

Att → 14.5

42

$$V_o = \frac{1}{T} \int v_{in} \cdot dt$$

Hajee Mohammad Danesh Science and Technology University, Dinajpur
Department of Electronics and Communication Engineering
B. Sc. (Engineering) in Computer Science and Engineering
Level 2 Semester II, Final Examination 2021
Course Code: ECE 259, Credit: 3.0
Course Title: Digital Electronics and Pulse Techniques

Time: 3 Hours

Marks: 90

Separated answers to a question is not allowed

Section - A

Answer any three of the followings

1. a) Illustrate how digital signal can be represented using positive logic and negative logic systems.
b) "Semiconductor switches are best suited for digital circuits over relays and mechanical switches"- Justify the statement.
c) Describe the use of a transistor as a switch.
d) Define the following characteristics of digital ICs.
 - i. Speed of operation
 - ii. Power dissipation
 - iii. Fan-out
 - iv. Noise immunity
 - v. Wired-logic capability

2

3

5

$$5 \times 1 = 5$$

2. a) Determine the complex transfer function of the low pass RC filter circuit and also sketch the frequency response curve of it.

4+2=6

- b) Consider an ideal $1\text{ }\mu\text{s}$ pulse with amplitude of 5 V is fed to a low-pass RC filter and the upper 3-dB frequency of this circuit is 10 MHz . Calculate the time constant of the circuit and draw the input output waveforms.

159154
-6

5

- c) Show that low-pass RC circuit can be used as an Integrator.

3. a) Define clipper and clamper. Write some applications of the clipper and clamper circuits.

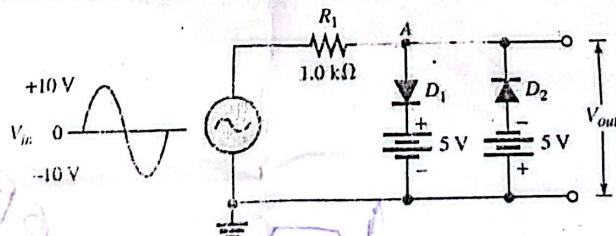
2+3=5

- b) Draw a circuit diagram of a parallel positive clipper circuit with negative reference voltage and sketch the output waveform for a sinusoidal input with peak value $V = +15\text{ volts}$, assuming that reference voltage, $V_r = -5\text{ volts}$.

3+3=6

- c) A sinusoidal input is applied to the following circuit. Considering D_1 and D_2 as ideal diodes, sketch the output waveform of the circuit.

4



4. a) Draw the circuit diagram of Integrated-Injection Logic (I^2L) inverter and explain its operation.

2+3=5

- b) Draw the circuit diagram of a 2-input CMOS NOR gate and explain its logical operation with mentioning the state of each transistor.

2+3=5

- c) Draw the circuit diagram of 3-input TTL NAND gate and discuss its logical operation with mentioning the state of each transistor.

2+3=5

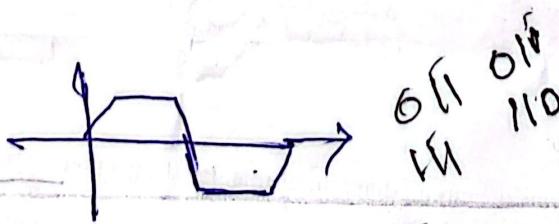
Section - B
Answer any three of the followings

1. a) Define linear wave shaping. Name some non-sinusoidal waveforms. 1+1=2
 b) Consider a high pass RC filter circuit with $R = 2k\Omega$ and $C = 10\mu F$. The circuit is fed an ideal pulse with amplitude of 5V and duration of 20 ms. Calculate the output voltage and sketch the input-output waveforms. 3+3=6
 c) A 10 Hz symmetrical square wave whose peak-to-peak amplitude is 2V is impressed upon a high-pass circuit whose lower 3-dB frequency is 5Hz. Calculate and sketch the output waveforms. 5+2=7

2. a) Define logic family. Mention the different types of bipolar and unipolar logic families. 1+4=5
 b) Briefly describe the current hogging problem of DCTL. 4
 c) Construct and briefly explain the OR logic operation using 2-input RTL NAND gate(s). 2+4=6

3. a) Define the terms "multivibrator" and "triggering of multivibrator". Mention some applications of the multivibrator circuit. 2+2=4
 b) Differentiate between astable, monostable, and bistable multivibrators. 4
 c) Draw the circuit diagram of a monostable multivibrator and discuss its operation. Also determine the duration of unstable state of the monostable multivibrator. 6+1=7

4. a) Differentiate between programmable array logic (PAL) and programmable logic array (PLA). Considering 4-bits input 0010, draw the circuit diagram of an R-2R ladder D/A converter circuit. 2+2=4
 b) Consider a 4-bit unipolar weighted-resistor D/A converter circuit with $R_F = 8R$, $V(1) = -1V$, and $V(0) = 0V$. Determine the analog output if the following bit sequence is used as input. 5
 c) A combinational circuit is defined by the following Boolean functions. Implement the circuit with programmable array logic (PAL). 10
6
5
12
 $F_1(A, B, C) = \sum_m(2, 3, 6, 7)$,
 $F_2(A, B, C) = \sum_m(0, 2, 3, 5)$, and
 $F_3(A, B, C) = \sum_m(1, 6, 7)$.



$$\overline{A} \cdot \overline{B} \\ \overline{A} + \overline{B}$$

$$ABC \\ A \cdot BC$$