

Sylhet Engineering College, Sylhet
(Shahjalal University of Science & Technology)
Department of Computer Science & Engineering

Final Examination, 2024

2nd Year 2nd Semester

Course No: MATH 201 Course Title: Complex Variables, Laplace's Transform and Fourier series

Time: 03 (Three) hours

Full Marks: 60

N.B. : (i) Marks allotted are indicated in the margin (ii) Use separate answer scripts for each PART

(iii) Special Instruction (if any)-----N/A-----

PART-A

1.(a) Find roots of $(-2\sqrt{3} - 2i)^{\frac{1}{4}}$ and locate them graphically. 04

(b) What do you mean by Argand plane? Describe geometrically and sketch the regions: 06

i) $1 \leq |z - 2i| \leq 3$ ii) $\text{Re}\left(\frac{1}{z}\right) \leq \frac{1}{2}$; where z is a complex number.

2.(a) Use de Moivre's theorem to solve $x^9 + x^5 + x^4 + 1 = 0$. 04

(b) Show that for the function $f(z) = \begin{cases} \frac{(z)^2}{z}, & z \neq 0 \\ 0, & z = 0 \end{cases}$ 06

C-R equations are satisfied at $(0, 0)$ but the function is not differentiable at $z = 0$.

3.(a) Define Harmonic function. Prove that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic. Find v such that $u + iv$ is analytic function of z . 06

(b) If $f(z)$ is analytic in a region R and on its boundary C with derivatives $f'(z)$ which is continuous at all inside R and on C then 04

$$\oint_C f(z) dz = 0$$

OR

3.(a) State and prove the Cauchy's integral formula. 06

(b) Evaluate the integral $\oint_C \frac{e^{tz}}{z^2+1} dz$, where C is the circle $|z|=3$ and $t \geq 0$ 04

PART-B

4.(a) Define with examples i) even function ii) periodic function iii) Fourier series 03

(b) Find the series of sine and cosine multiples of x which represents $f(x)$ in $(-\pi, \pi)$ 07
 where $f(x) = \begin{cases} 0; & -\pi < x < 0 \\ \frac{\pi x}{4}; & 0 < x < \pi \end{cases}$

5.(a) Define convolution. State and prove the convolution theorem of Fourier transformation. 05

(b) Using the Fourier cosine transformation solve: $\frac{\partial U}{\partial t} = \frac{\partial^2 U}{\partial x^2}$, $U_x(0, t) = 0$, $U_x(6, t) = 0$, $U(2, t) = 0$, $U(x, 0) = 2x$, $0 < x < 6$, $t > 0$. 05

6.(a) Solve : $Y''(t) - 6Y'(t) + 9Y(t) = t^2 e^{3t}$, $Y(0) = 2$, $Y'(0) = 6$ 05

(b) Define Laplace transformation. Find the Laplace transformation of the following functions i) $t^3 e^{-2t}$ and ii) $e^{2t} \sin 4t$ 05

OR

6.(a) If $L\{F(t)\} = f(s)$ then prove that i) $L\{F'(t)\} = sf(s) - F(0)$ and ii) $L\{F''(t)\} = s^2 f(s) - sF(0) - F'(0)$ 05

(b) Define inverse Laplace transformation. Find the inverse Laplace transformation of 05

i) $\frac{3}{4s^2+36}$ ii) $\frac{7s-3}{s^2-2s+5}$

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Final Examination, 2024
Course No: CSE 245
Time: 03 (Three) hours

2nd Year 2nd Semester
Course Title: Digital Logic Design
Full Marks: 60

N.B. : (i) Marks allotted are indicated in the margin (ii) Use separate answer scripts for each PART
 (iii) Special Instruction (if any)-----N/A-----

PART-A

- | | | | |
|-------|-----|------------------------------------------------------------------------------------------------------------------|----|
| 1.(a) | i. | Convert the Gray code 11010011 to binary number. | 2+ |
| | ii. | Convert the decimal number 237.95 to BCD code. | 2 |
| (b) | | Implement a two input X-OR gate using only two input NAND gates. | 03 |
| (c) | | Express the Boolean function $F = xy + \bar{x}z$ in a product of maxterms. | 03 |
| 2.(a) | | Develop a truth table for the following SOP expression:
$(A)\bar{B} + AB(C)\bar{+} A\bar{C}\bar{+} AB\bar{C}$ | 02 |
| (b) | | Summarize the Boolean function $x'y'z + x'yz' + xy'z' + xyz'$ without using K- map? | 05 |
| (c) | | Simplify the expression: $(\overline{A + B}).B.(A + \bar{C})$ | 03 |
| 3.(a) | | What is the difference between combinational circuit and sequential circuit? | 02 |
| (b) | | Draw the circuit diagram of a full adder using half adders and OR gate. | 03 |
| (c) | | Construct a 1x16 De-multiplexer with 1x4 De-multiplexers and describe briefly how it works. | 05 |

OR

- | | | | |
|-------|--|----------------------------------------------------------------------------------------------|----|
| 3.(a) | | Write the output expressions of a 3-bit comparator. | 04 |
| (b) | | Implement the function using an 8x1 Multiplexer:
$F(A, B, C, D) = \sum m(0,1,3,4,8,9,15)$ | 06 |

PART-B

- | | | | |
|-------|--|-------------------------------------------------------------------------------------|----|
| 4.(a) | | How does a priority encoder differ from an ordinary encoder? | 02 |
| (b) | | Write the output expressions with truth table of a Decimal to BCD priority encoder. | 04 |
| (c) | | Draw the block diagram with truth table of a 4x16 decoder using two 3x8 decoders. | 04 |
| 5.(a) | | Define race around condition? How it can be avoided? | 03 |
| (b) | | Convert a JK Flip Flop to i) SR ii) T iii) D | 07 |
| 6.(a) | | Implement a 3-bit asynchronous counter. | 04 |
| (b) | | Draw the circuit diagram of a MOD-10 synchronous counter with truth table. | 06 |

OR

- | | | | |
|-------|--|----------------------------------------------------------------------------------------------|----|
| 6.(a) | | What is counter modulus? | 02 |
| (b) | | Design a synchronous counter that has the following counting sequence:
000, 010, 101, 110 | 08 |

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Final Examination, 2024

Course No: CSE 247

Time: 03 (Three) hours

2nd Year 2nd Semester

Course Title: Computer Architecture

Full Marks: 60

N.B. : (i) Marks allotted are indicated in the margin

(ii) Use separate answer scripts for each PART

(iii) Special Instruction (if any)-----N/A----

PART-A

- 1.(a) What do you mean by Computer Architecture? Show the structure of Von Neumann Machine and explain its operation. 05
- (b) Use Restoring Division Algorithm for dividing the following two numbers: 05
Dividend, $Q = 8 = 01000$ and Divisor, $M = 3 = 0011$
- 2.(a) Mention the difference between multiple computer systems and microprocessors 04
- (b) Define pipelining with example. Describe performance of pipeline processor 06
- 3.(a) What is Computer performance 02
- (b) If computer A runs a program in 10 seconds and computer B runs the same program in 15 seconds how much faster is A than B? 02
- (c) Discuss the concept of virtual memory and its significance in computer architecture. 03
- (d) Explain the concept of clock cycles and their importance in computer processing. 03

OR

- 3.(a) What is the difference between software and hardware interrupts? 03
- (b) Briefly explain addressing mode with example and diagram. 07

PART-B

- 4.(a) Write a short note on Memory Hierarchy and draw the basic structure of Memory 05
- (b) Describe Cache memory with Working Principal. 05
- 5.(a) Define and draw the instruction format. 03
- (b) Write down the five stages of Instruction Executions 03
- (c) Explain various instruction format illustrate the same with an example 04
- 6.(a) What do you mean by pipeline hazards? Discuss about the different hazards in pipelining. 05
- (b) What is Flynn's taxonomy? Describe Flynn's taxonomy of computer architecture. 05

OR

- 6.(a) What is DMA? Draw the block diagram that shows how a DMA controller operates in a microcomputer system? 06
- (b) Show the block diagram accumulator-based CPU Organization and write the operation of each block. 04

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Final Examination 2024

Course No: BUS 201

Time: 02 (Two) hours

2nd Year 2nd Semester

Course Title: Cost and Management Accounting

Full Marks: 60

N.B. : (i) Use separate answer scripts for each PART
 (iii) Special Instruction (if any)-----N/A-----

(ii) Marks allotted are indicated in the margin

PART-A

1. (a) Define cost accounting. Compare cost accounting with financial accounting 03
- (b) Briefly discuss the **Characteristics of an Ideal Cost Accounting System.** 03
- (c) The accountants of G. M. Manufacturers Ltd. For the year ending on 31st December, 2005, shows the following: 09

	Tk.		Tk.
Stock of the materials on 1 st January, 1995	67,200	Sales	6,00,000
Materials purchased	2,59,000	Manager's salary (2/3 for factory, 1/3 for office)	15,000
Bad debt written off	9,100	Depreciation on plan and machinery	18,200
Travellers' salaries and commission	10,780	Cash discounts allowed	4,060
Depreciation written off office furniture	420	Repairs to plant and machinery	6,230
Rent, rates, taxes and insurance (factory)	11,900	Carriage and cartage outwards	6,020
Productive wages	1,76,400	Direct expenses	10,010
General expenses	8,400	Rent rates and insurance (office)	2,800
Gas and Water (factory)	1,680	Gas and water (office)	560
Travelling expenses	2,940	Stock of materials as on 31 st December, 2005	87,920

Prepare a statement giving the following information: i. Material Consumed, ii. Prime cost, iii. Factory cost, iv. Cost of production, v. Cost of sales vi. Net profit

2. (a) Distinguish clearly between direct and indirect materials. Under what circumstances may direct materials be charged indirectly to the finished product? 05
- (b) Draw a stores ledger account recording the following transactions that took place in January 2022, under FIFO method: 10

Jan 01	Balance in hand	500 pieces	@ Tk. 200 each
Jan 04	Issued	300 pieces	
Jan 5	Received	400 pieces	@ Tk. 225 each
Jan 9	Issued	200 pieces	
Jan 16	Issues	50 pieces	
Jan 23	Received	200 pieces	@ Tk. 250 each
Jan 28	Issued	150 pieces	
Jan 30	Received	50 pieces	@ Tk. 240
Jan 31	Issued	300 pieces	

OR

2. (a) Differentiate between LIFO and FIFO method of storage ledger account. 05
- (b) Discuss the term "Idle time and discuss how it should be dealt with for cost accounting purpose. 05

- (c) Calculate the earnings of workers A, B and C under Straight Piece Rate System and Merrick's Multiple Piece Rate system from the following particulars: 05
- Normal rate per hour ----- Rs. 5-40
 Standard time per unit ----- 1 minute
 Output per day is as follows:
 Worker A ---- 390 units
 Worker B ---- 450 units
 Worker C ---- 600 units
 Working hours per day are 8.

PART-B

3. (a) Critically analyze the Critical value analysis and ABC analysis with examples. 05
 (b) Differentiate between perpetual and periodic inventory system 05
 (c) From the following particulars relating to inventory find out: 05
 a. How much should be ordered each time
 b. When should the order be placed
 c. C. What should be the ideal inventory level immediately before the delivery of material is received
 d. How many times orders for EOQ should be placed in a year
Info: Annual Consumption-12000 units, Cost per unit- \$1, Ordering cost- \$ 12 per orders, Inventory carrying charge-20%, Normal lead time-15 days, Safety stock- 30 days consumption
4. (a) Define EOQ and BEQ. Identify the managerial application of EOQ and BEQ. 05
 (b) Evaluate how changes in the sales mix of a multi-product company can affect overall break-even point and profitability. Which mix should the firm adopt and why? 05
 (c) The Automotive Supply Company has a small plant that produces speedometers exclusively. Its annual fixed costs are \$30,000, and its variable costs are \$10 per unit. It can sell a speedometer for \$25. 05
 i. How many speedometers must the company sell to break even?
 ii. What is the break-even revenue? Draw a BEP graph.
 iii. The company sold 3,000 units last year. What was its profit?
 iv. Next year's fixed costs are expected to rise to \$37,500. What will be the break-even quantity?
 v. If the company will sell the number of units obtained in part d and wants to maintain the same profit as last year, what will its new price have to be?

OR

4. (a) Evaluate the role of margin of safety in assessing financial risk. Can a high margin of safety always guarantee long-term profitability? Explain with justification. 05
 (b) Identify the features of a successful wage plan. 05
 (c) Compare and contrast batch costing and job costing. Suggest two types of business where batch costing would be appropriate. 05

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Final Examination 2024
Course No: CSE 243
Time: 03 (Three) hours

2nd Year 2nd Semester
Course Title: Algorithms
Full Marks: 60

N.B. : (i) Use separate answer scripts for each PART
 (iii) Special Instruction (if any)-----N/A-----

(ii) Marks allotted are indicated in the margin

PART-A

1. a) Find **O(n), Ω(n), θ(n)** for following function. 3
 $f(n) = 8n^3 + 2n.$
- b) Given a text and a pattern, use the Knuth-Morris-Pratt (KMP) algorithm to find all occurrences of the pattern in the text. 5
Text: AABAACAADAABAABA
Pattern: AABA
- c) Compare between Dynamic programming and Greedy Algorithm 2
2. a) Let the data 95, 45, 72, 39, 81, 56, 63 are stored in A[1] to A[6]. Now show each step to sort those data using **Quick Sort** algorithm. 6
- b) Consider the following 10 activities with their starting and finishing time. Find non-conflicting activities using activity selection problem. 4

Activity	A	B	C	D	E	F	G	H
start	2	1	4	6	3	7	5	8
finish	5	3	6	8	7	9	10	11

3. a) Consider the following instance of the **Knapsack Problem**: 8
 Number of Given Object, $n = 5$ and Maximum Weight, $m = 20$. Here P_i and W_i denote the price and weight of the i -th product respectively.

P_i	10	5	15	7	8
W_i	7	4	3	5	2

Now calculate Solution using **Dynamic algorithm**.

0/1 knapsack(b, w, n, m)

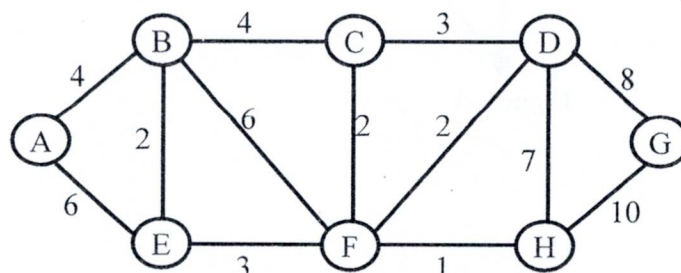
1. for $w = 0$ to m do
2. $v[0, w] = 0$
3. for $i = 1$ to n do
4. $v[i, 0] = 0$
5. for $i=1$ to n do
6. for $w = 1$ to m do
7. if $w_i \leq w$ then
8. if $(b_i + v[i-1, w-w_i]) > v[i-1, w]$ then

9. $v[i, w] = \max(b_i + v[i-1, w-w_i], v[i-1, w])$
10. else $v[i, w] = v[i-1, w]$
11. Let $i=n$ and $k=m$
12. while $i, k > 0$
13. {
14. if $v[i, k] \neq v[i-1, k]$ then mark the i th item
15. $k = k - w_i, i--$
16. else $i--$ }

- b) How many edges contain a **Spanning Tree** of N vertex? 2

OR

3. a) Find the Shortest Path from vertex A to G using Dijkstra's Algorithm. Show all steps. 7

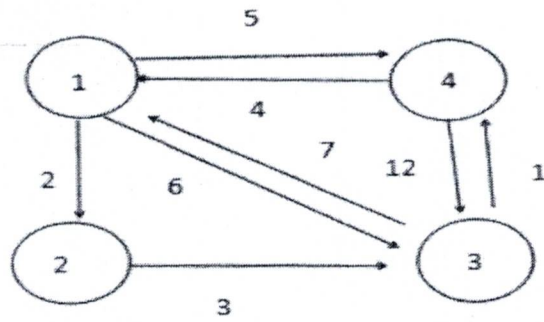


- b) Show the similarities of implementation between dijkstra's algorithm and Prim's algorithm. 3

OR

6. a) Show the steps for finding all pair shortest path using Floyd-Warshal algorithm for the following graph.

```
i.Allpath(Cost,A,n){
ii.fori=1 to n do
iii.for j=1 to n do
iv.A[i,j]=cost[i,j]
v.for k=1 to n do
vi.fori=1 to n do
vii.for j=1 to n do
viii.A[i,j]=min(A[i,j],A[i,k]+A[k,j])
ix.}
```



b) Solve the following system of simultaneous congruences using the Chinese Remainder Theorem:

$$x \equiv 1 \pmod{4}$$

$$x \equiv 2 \pmod{5}$$

$$x \equiv 3 \pmod{6}$$

Show all the steps involved in solving this system, including:

i) Calculating the product of the moduli

ii) Computing the partial products

iii) Finding the multiplicative inverses of the partial products modulo the respective moduli

iv) Summing the results and finding the final solution modulo the product of the moduli.

What is the final value of x?