

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 2nd Year 2nd Term Examination, 2020
 Department of Computer Science and Engineering
 CSE 2201

Algorithm Analysis and Design

TIME: 1.5 hours

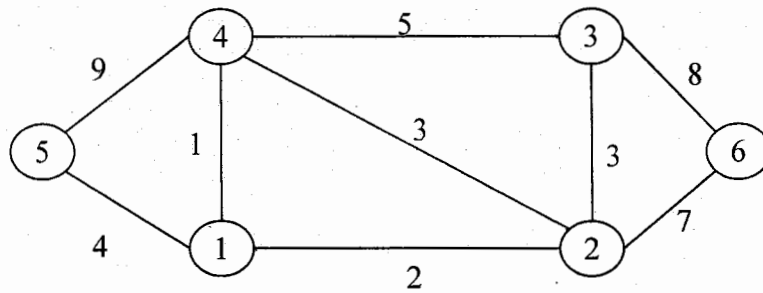
FULL MARKS: 120

- N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

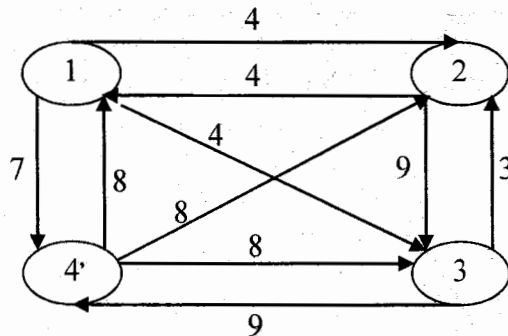
SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) What is an algorithm? Why is the order of an algorithm generally more important than the speed of the processor? (09)
 b) Define minimum spanning tree. Apply prim's algorithm on the graph shown in the following figure to determine minimum cost spanning tree. (15)



- c) What is a pre-condition? Write down the pre-conditions of Bellman-Ford algorithm. (06)
2. a) Consider the following Traveling Salesperson Problem (TSP): (18)

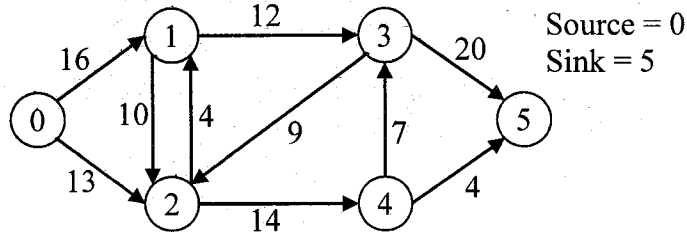


- i) Convert it to a Multi-stage Graph.
 ii) Find the minimum cost path in the Multi-stage graph (From (i)). Do this using the backward approach.
- b) What are the implicit and explicit constraints for N-Queen problem? Applying these constraints, write a recursive backtracking algorithm to solve N-Queen problem. (12)
3. a) Give the best Big-oh (O) characterization for each of the following running time estimates of the algorithms. (12)
- (i) $\log(n)+1000$ (ii) $2^{10}+3^5$ (iii) $n\log(n)+15n+0.002n^2$
- b) Let $w = \{6, 7, 11, 12, 15, 19, 20\}$ and $m = 36$. Find all possible subsets of w that sum to m . (18)
 Draw the portion of state space tree that is generated.

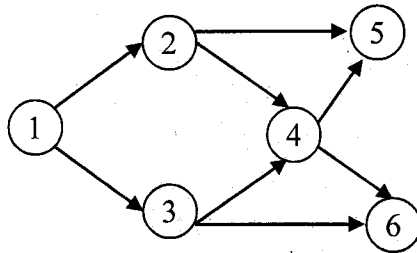
SECTION B

(Answer ANY TWO questions from this section in Script B)

4. a) Apply Relabel-to-Front algorithm for the following network. Show each step of changing height and flow changing. (20)



- b) What is topological sort? Give a linear ordering of nodes of the following graph showing visiting time and finishing time for each node. (10)



5. a) Prove that satisfiability of Boolean formulas in 3-CNF is NP-complete. (13)
 b) What is lower bound? Derive a lower bound for finding minimum and maximum number from n distinct numbers. (12)
 c) Briefly explain the necessity of approximation algorithm. (05)
6. a) Briefly explain (with example) the work-optimal logarithmic time prefix computation algorithm. (12)
 b) Compute $18+23*31$ using modular arithmetic transformation, where $P_1 = 13$ and $P_2 = 19$. (12)
 c) What is Negative Weight cycle? How does Bellman-Ford solve the negative cycle's problem? (06)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 2nd Year 2nd Term Examination, 2020
 Department of Computer Science and Engineering
 CSE 2203

Microprocessors and Microcontrollers

TIME: 1.5 hours

FULL MARKS: 120

- N.B. i) Answer ANY TWO questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

SECTION A

(Answer ANY TWO questions from this section in Script A)

1. a) Suppose you want to build a system using a microcontroller, but you are not sure about which (07)
 microcontroller should be used to build the system. Briefly explain how the proper
 microcontroller should be chosen for building this system?
- b) 8087 has a stack of 80-bit registers labeled (0) – (7). What will be the condition of these stack (12)
 registers after performing the following operations sequentially?
 i) After reset
 ii) After 3 PUSH operations.
 iii) After 1 POP operations.
 iv) After 5 PUSH operations.
 v) After 2 POP operations.
- c) Consider the contents of Control Word Register (CWR) of 8254 shown in the following figure. (11)

$$A_0, A_1 = 11, \overline{CS} = 0, \overline{RD} = 1, \overline{WR} = 0$$

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
1	1	0	0	0	1	1	0

If the command is written into the CWR and has the format shown in the above figure, then a specific command will be executed. Briefly explain the operation of the executed command.

2. a) Show the stack and stack pointer (SP) of 8051 microcontroller for the following code. Assume (10)
 the default stack area and register 0 is selected.

```
MOV R6, #25H
MOV R1, #12H
MOV R4, #0F3H
PUSH 6,
PUSH 4
PUSH 1
```

Also, consider the stack shown in the following figure.

0B	54	Start SP = 0B.
0A	F9	
09	76	
08	6C	

Show the contents of registers and stack pointer (SP) after execution of the following instructions. All values are in hex.

```
POP 3
POP 2
POP 5
```

- b) Is it possible to achieve 1Gbyte of logical or virtual address space using Memory Management (11)
 Units (MMUs) in 80286, 80386 and 80486 microprocessors? If it is possible, then explain
 how this 1Gbyte can be achieved using proper diagram(s). Otherwise, give proper logic why
 it is not possible to achieve 1Gbyte of logical or virtual address space in 80286, 80386 and
 80486.
- c) With the following code a port of 8051 microcontroller will be activated. (09)

```
MOV A, #0FFH
MOV P3, A
```

Briefly explain the basic and alternate functions of the activated port.

3. a) Suppose, interrupts TF1, INT0 and INT1 of 8051 microcontroller are activated at the same time. Assume that after reset, the interrupt priority is set by the instruction MOV IP, #00011000B. Discuss the sequence in which the interrupts are serviced after setting this value to IP register of 8051 microcontroller. (09)
- b) Suppose, you have to read a disk file and then write it to a memory location bypassing the CPU and transfer data directly from disk file to memory. Now, briefly describe this data transfer process using necessary diagram(s). (11)
- c) Consider the register of 8051 microcontroller shown in below. (10)

SM0	SM1	SM2	REN	TB8	RB8	TI	RI
-----	-----	-----	-----	-----	-----	----	----

What is the name of this register? Briefly describe the functions of each bit of this register.

SECTION B

(Answer ANY TWO questions from this section in Script B)

4. a) What are the features of Intel 8086? Write the flags in 8086? (10)
- b) Construct the binary code for each of the following 8086 instructions. (12)
- i) MOV CS:[BX], DL
- ii) IN AL, DX
- iii) ADD BX, 59H[DI]
- c) Detect and correct syntax errors in the following instructions if there is any. (08)
- i) MOV BX, [3502H]
- ii) MOV DX, CL
5. a) Explain the following addressing modes in 8086 microprocessor. (12)
- i) Immediate mode.
- ii) Register indirect mode.
- iii) Based indexed mode.
- b) What is the function performed by RET instruction? Which conditional jump instructions follow the comparison of signed numbers? (09)
- c) Calculate the value of N for the following code which generates 5 seconds delay if 8086 system frequency is 4 MHz. (09)

```

MOV BX, N                ; Clock Cycles
                          ; 04
REPEAT: MOV CX, AFF0H    ; 04
        BACK: DEC CX      ; 02
              JNZ BACK     ;16/4
              DEC BX       ; 02
              NOP          ; 03
              JNZ REPEAT   ;16/4

```

6. a) What are the significances of reentrant procedure and recursive procedure? Explain with proper illustrations. (08)
- b) "The loop instruction decreases the CX register but does not affect the zero flag" – Justify the statement with example(s). (08)
- c) Let us consider the SS contains 5000H and SP contains FFE0H. Then (07)
- i) Determine the physical address.
- ii) Calculate the lower range and upper range of the mentioned segment.
- iii) Determine the maximum size of the stack segment.
- d) What is bit-slice microprocessor? Demonstrate the different advantages of bit-slice microprocessors. (07)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 2nd Year 2nd Term Examination, 2020
 Department of Computer Science and Engineering
 CSE 2207
 Numerical Methods

TIME: 1.5 hours

FULL MARKS: 120

- N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) Discuss about errors in numerical computing. Differentiate between bisection method and false position method. (10)
- b) Solve $\sin x - x = 0$ using Newton-Raphson method. (10)
- c) Discuss the techniques of secant method. (10)
2. a) Derive the formula for Lagrange interpolation. Using this formula, estimate $f(x)$ when $x = 2.5$ from the following data points. (20)

x	1	2	3	4
$f(x)$	0	7	26	63

- b) Estimate the value of $e^{2.5}$ using the Newton-Gregory forward difference formula. (10)

i	0	1	2	3
x_i	0	1	2	3
$e^{x_i} - 1$	0	1.7183	6.3891	19.0855

3. a) Derive least square regression formula. Using this formula, fit the following data points. (15)

x	1	2	3	4	5	6
y	3	4	5	6	8	10

- b) Describe Fadeev-Leverrier method for finding eigen value and eigen vector. (15)

SECTION B

(Answer **ANY TWO** questions from this section in Script B)

4. a) What do you mean by Numerical Integration? (05)
- b) Derive a general quadrature formula for equidistance ordinates. (15)
- c) Evaluate $\int_0^4 e^x dx$ by Simpson's $\frac{1}{3}$ rule given that $e=2.72$, $e^2=7.39$, $e^3=20.09$, $e^4=54.60$ and compare it with the actual value. (10)

5. a) What do you mean by ordinary differential equation? Explain it with an example. (10)
- b) Derive the equation for the Modified Euler's Method. (10)
- c) Use Runge-Kutta method to approximate y , when $x = 0.1$ and $x = 0.2$, given that $x = 0$ when $y = 1$ and $\left(\frac{dy}{dx}\right) = x + y$. (10)

6. a) Solve the following equations. (15)

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8$$

by factorization method.

- b) Find the inverse of $A = \begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 1 & -1 \end{bmatrix}$. (15)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 2nd Year 2nd Term Examination, 2020
Department of Computer Science and Engineering
HUM 2207

Economics and Accounting

TIME: 1.5 hours

FULL MARKS: 120

N.B. i) Answer **ANY TWO** questions from each section in separate scripts.

ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) In disasters like COVID-19, price gauging leads to looting – Explain in light of laws of demand and supply. (15)
b) Monetary policy becomes ineffective in ‘liquidity trap’ situation – Analyze. (15)
2. a) ‘Supply creates its own demand’ – Examine critically. (15)
b) Export diversification and international trade policy – What limitations do Bangladesh have? (15)
3. a) Establish relationship between APC and MPC in short-run and in long-run. (10)
b) ‘True inflation begins after full employment’ – Argue. (10)
c) Briefly discuss circular flow of national income in the perspective of Bangladesh. (10)

SECTION B

(Answer **ANY TWO** questions from this section in Script B)

4. a) Define accounting. State the functions of accounting. (12)
b) Define transaction. Discuss the features of transactions. (10)
c) What is accounting equation? Describe the elements of accounting equation. (08)
5. a) What do you mean by trial balance? (05)
b) What are the errors that can't be detected by the trial balance? (10)
c) The following accounts are taken from the ledger of Himaloy Trading Company at December 31, 2019. (15)

Name of accounts	Tk.
Cash at bank	43,400
Sales return	2,800
Sales	48,500
Depreciation	700
Allowance for bad debit	31,000
Accumulated depreciation	19,500
Advance paid salaries	31,100
Interest received	67,000
Rent Receivable	27,550
Motor car	41,500
Profit on sale of furniture	11,250
Bills Payable	20,250
Income tax expense	26,700
Loss on fire	2,650
Goodwill	21,100

Prepare a trial balance.

6. a) The trial balance for M. Rahman and Co. on June 30, 2019, the accounting period ended. (30)

M. Rahman and Co.
Trial balance as on June 30, 2019

Account Titles	Debit (Taka)	Credit (Taka)
Cash	14,400	
Accounts receivable	7,620	
Supplies	1,250	
Prepaid insurance	4,400	
Equipment	38,000	
Notes payable		14,000
Capital		28,000
Drawing	1,600	
Service revenue		17,620
Salaries expense	2,200	
Travel expense	2,000	
Rent expense	2,200	
Miscellaneous expense	300	
Accounts payable		14,350
Total	73,950	73,950

Additional information:

- i) Supplies on hand total Tk. 650.
- ii) Depreciation is Tk. 500 for six months.
- iii) Insurance expired at the rate of Tk. 250 per month.
- iv) Service provided but unbilled at June 30, total Tk. 950.

Instructions:

- i) Prepare a statement of comprehensive income for the period ended June 30, 2019 (for six months)
- ii) Prepare owner's equity statement.
- iii) Prepare a statement of financial position.

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
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 Department of Computer Science and Engineering
 MATH 2207

Complex Variable. Vector Analysis and Statistics

TIME: 1.5 hours

FULL MARKS: 120

- N.B. i) Answer **ANY TWO** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY TWO** questions from this section in Script A)

1. a) At first you will sketch a quadrilateral PQRS, where $P(0, 0)$, $Q(b + 2, 0)$, $R(b + 2, c + 3)$, $S(0, c + 3)$; here a, b, c are the last three digits of your roll number (*). (20)
- (i) Represent the quadrilateral in vectors form (matrix form).
 - (ii) Using vectors (matrix) rotating transformation rotated it 45° (anti-clock wise).
 - (iii) Hence shift left (negative direction) by the value of 'a'.
 - (iv) Sketch the final form of the transformed quadrilateral $P'Q'R'S'$ (rotating the coordinate value)
- b) If $\vec{V} = (a+1)t\hat{i} + (b+2)t\hat{j} - ct\hat{k}$, then find tangent vector and directional derivative along \hat{j} direction for $t = c$. Here a, b, c are the last three digits of your roll number (*). (10)
2. a) Find first four moments of the following observations. Hence find mean and coefficient of variation and β_1 . Where a, b, c are the last three digits of your roll number (*). (30)

x	1	2	3
f	b	$c+1$	$a+2$

3. a) if $f(x) = \begin{cases} \frac{1}{p-q} & ; q \leq x \leq p \\ 0 & ; \text{otherwise} \end{cases}$ (17)

Here $p = c+15$ and $q = 4+a+b$; a, b, c are the last three digits of your roll number (*).

- (i) Test whether $f(x)$ is pdf or not.
 - (ii) If possible find first three moments.
 - (iii) Hence, find mean and coefficient of variation.
 - (iv) Also sketch $f(x)$.
- b) Three coins are tossed 20 times and count the number of head. The observation is summarized as follows: Where a, b, c are the last three digits of your roll number (*). (13)

No. of head	0	1	2	3
Frequencies	a	b	c	d

- (i) Find the value of d .
- (ii) Fit the data to binomial distribution assuming coins are fair. (need not test)
- (iii) Also estimate the number of heads if coins are tossed 100 times.

→ zero

Notes * if Roll No: 1807001, then $a = 0, b = 0, c = 1$
 Roll No: 1807123, then $a = 1, b = 2, c = 3$

SECTION B

(Answer ANY TWO questions from this section in Script B)

4. a) Determine the set of points in the complex plane which satisfies the inequality $|z + a - i| \leq |z - a + i|$. Also sketch it; where a is the sum of last two digits of your roll number (**). (15)
- b) Show that the function $u = e^x(x \cos y - y \sin y)$ is harmonic. Find the conjugate harmonic function v and express $u + iv$ as an analytic function of z . (15)
5. a) What do you mean by singularities at infinity? Locate and name all the singularities of the following functions: (18)
- (i) $f(z) = \frac{\ln(z-3)}{(z^2 + 2z + 3)^4}$
- (ii) $f(z) = \sin^{-1}\left(\frac{1}{z}\right)$
- b) Using Cauchy's integral formula, evaluate $\oint_C \frac{\sin^6 z}{\left(z - \frac{\pi}{6}\right)^3} dz$, where C is the circle $|z| = 1$ (12)
6. a) Evaluate $\oint (x^2 - 2xy)dx + (x^2 y + 3)dy$ around the boundary of the region defined by $y^2 = 8x$ and $x = 2$ by using Green's theorem. (15)
- b) Evaluate $\iiint_V (xy\hat{i} + 2x^2z\hat{j} + a\hat{k})dv$ where V is the cube bounded by $x = 0, y = 0, z = 0, x = a+1, y = a+1, z = a+1$, here a is the sum of last two digits of your roll number (**). (15)

N.B.

Notes ** if Roll No: 1807012, then $a = 1 + 2 = 3$; $a + 1 = 4$; $a + 2 = 5 = p$
Roll No: 1807100, then $a = 0 + 0 = 0$; $a + 1 = 1$; $a + 2 = 2 = p$