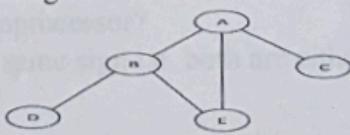


- i) Answer SIX questions, taking any THREE from each section.
- ii) For each question answer must be sequentially

Section A

- | | | | |
|-----|-----|---|-----|
| Q.1 | (a) | What is artificial intelligence? | 1 |
| | (b) | Write some advantages and disadvantages of AI. | 3 |
| | (c) | Define agent. Write down the structure of agent. | 1+2 |
| | (d) | What is environment? List and explain the properties of environment. | 1+2 |
| Q.2 | (a) | What is planning in an AI context? Write the components of a planning system with explanation. | 5 |
| | (b) | How does A* search algorithm minimize the estimation cost of greedy best first search algorithm? Explain with a suitable example. | 5 |
| Q.3 | (a) | What is knowledge? Discuss different types of knowledge. | 1+3 |
| | (b) | What is proposition? Discuss about properties of statements. | 1+3 |
| | (c) | Represent the following English sentences into FOPL: <ul style="list-style-type: none"> I. All employee earning \$1500 or more per year pay taxes II. Some employees are sick today. III. No employee earns more than the president. | 2 |
| Q.4 | (a) | Explain the learning structure algorithm for Bayesian Network. | 5 |
| | (b) | Illustrate the Maximum-Likelihood Estimation method. | 5 |

Section B

- | | | | |
|-----|-----|--|-----|
| Q.5 | (a) | Consider the following facts represented in predicate logic: <ul style="list-style-type: none"> i. man(Marcus) ii. Pompeian(Marcus) iii. $\forall x: \text{Pompeian}(x) \Rightarrow \text{Roman}(x)$ iv. Ruler(Caesar) v. $\forall x: \text{Roman}(x) \Rightarrow \text{loyalto}(x, \text{Caesar}) \vee \text{hate}(x, \text{Caesar})$ vi. $\forall x \exists y: \text{loyalto}(x, y)$ vii. $\forall x \forall y: \text{person}(x) \wedge \text{ruler}(y) \wedge \text{tryassassinate}(x, y) \Rightarrow \neg \text{loyalto}(x, y)$ viii. tryassassinate(Marcus, Caesar) | 5 |
| | | Now, using the resolution, prove that Marcus hates Caesar. | |
| | (b) | Compare between backward chaining and forward chaining. | 3 |
| | (c) | How does Fuzzy Logic overcome the problem of Boolean Logic? | 2 |
| Q.6 | (a) | Traverse the all nodes, start from node A, using the techniques of BSF and DFS for the following graph by showing the open list and closed list in each step: | 6 |
| | (b) |  | 2 |
| | (c) | Write the main differences between BFS and DFS algorithms. | 2 |
| | (c) | What do you mean by backtracking? Explain in the context of the DFS algorithm. | 2 |
| Q.7 | (a) | Define the following terms with example: i) Logical equivalence ii) Validity iii) Satisfiability | 3 |
| | (b) | Distinguish among horn clauses, definite clauses and goal clauses? | 2 |
| | (c) | By showing each step, convert the following sentence into CNF:
$[(\text{Food} \rightarrow \text{Party}) \vee (\text{Drinks} \rightarrow \text{Party})] \rightarrow [(\text{Food} \wedge \text{Drinks}) \rightarrow \text{Party}]$ | 5 |
| Q.8 | (a) | What is expert system? Mention some applications of an expert system. | 1+3 |
| | (b) | List and explain the steps in developing the expert system. | 3 |
| | (c) | Analyze 8-puzzle problem with respect to the following problem characteristics: <ul style="list-style-type: none"> i. Is the problem decomposable? ii. Can solution step be ignored? iii. Is the good solution absolute or relative? iv. Is the solution state or a path? v. What is the role of knowledge? | 3 |

- i. Answer SIX questions taking any THREE from each section.
- ii. All parts of a question must be answered sequentially.

Section-A

1. a) The hexadecimal codes for instructions AND, ADD, STO, ISZ, BSB and BUN are 0H, 1H, 2H, 3H, 4H and 5H respectively. Explain what happens during execution of these instructions showing necessary figures. 4
- b) Explain the register-transfer operations during fetch cycle and execute cycle. 4
- c) Explain how a bidirectional bus buffer is operated. 2
- (d) Explain the different addressing modes of microprocessor. 6
- e) Make a 16X1 mux using 4X1 muxes. 4
3. a) Design a 4-bit combinational logic shifter with the following operations: 6

H_1	H_0	$H_2 = 0$	$H_2 = 1$
0	0	$F = A$	$F = A$
0	1	$F = \text{shr } A \text{ with input } I_R$	$F = \text{shr } A \text{ with LSB}$
1	0	$F = \text{shl } A \text{ with input } I_L$	$F = \text{shl } A \text{ with MSB}$
1	1	$F = \text{all } 0\text{'s}$	$F = \text{all } 1\text{'s}$

- b) What is system failure? Write some possible causes of a system failure. 4
- (4) d) Design an arithmetic unit using two selection variables, S_1 and S_0 , that generates the following arithmetic operations (use an adder and basic gates). 8

S_1	S_0	$C_{in} = 0$	$C_{in} = 1$
0	0	$F = A$	$F = A + 1$
0	1	$F = A - B - 1$	$F = A - B$
1	0	$F = B$	$F = B + 1$
1	1	$F = B - A - 1$	$F = B - A$

↳ How does DRAM differ from SRAM?

Section-B

5. a) Explain the occurrence of overflow with necessary figure while performing addition of two numbers. 3
- b) Assume that you have a memory unit with 8-bits per word and an operation code contains 8-bits. Explain the operation of three possible instruction formats i.e. implied, immediate operand and direct address. 5

6. a) What are bus-request and bus-granted control lines of microprocessor? 2
- Design a digital system that subtract two numbers which are of same sign i.e. both are either positive or negative. 10

- i. Draw the flowchart of the system
- ii. Draw the state diagram of the system and show the control outputs of each control states.
- iii. State the Boolean functions for the output controls.
- iv. Design the control unit using one flip-flop (D flip-flop) per state.

7. a) What is multiplexer? Explain the concept of binary multiplexer. 3
- b) Using JK flip-flops design one typical stage of a register that performs the following logic microoperations: (draw necessary figures) 7

$$p_1: A \leftarrow \overline{A \vee B}$$

$$p_2: A \leftarrow A \wedge B$$

$$p_3: A \leftarrow A \odot B$$

8. a) What is DMA? Describe the working procedure of DMA controller in a microcomputer system. 6

- ↳ With a neat logic diagram, explain the working of positive edge triggered D flip-flop. 4

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science & Engineering

4th Year 1st Semester B.Sc. Engineering Examination-2021

Course : CSE 411 Communication Engineering

Full Marks: 60 Time: 03 hours

N.B. (i) Answer any three from each section

(ii) Answer each question sequentially

Section-A

- Q.1 (a) What is data communication? How does the term jitter effect on effective data communication systems? 3
(b) Draw a hybrid topology with a ring backbone and three bus network. 4
(c) What is protocol? Describe the key elements of a protocol. 3
- Q.2 (a) What is the spectrum of a signal? How can a composite signal be decomposed into its individual frequencies. 4
(b) Describe data link layer and transport layer of the OSI model. 2
(c) Define analog, digital, periodic and aperiodic signals. 2
- Q.3 (a) Distinguish between signal level and data level with appropriate figure. 4
(b) For the bit stream 01011001, sketch the waveforms for Manchester and differential Manchester schemes encoding format. 4
(c) Describe the benefits of block coding over line coding schemes. 2
- Q.4 (a) Describe evaluation of 3G cellular system from 2G cellular system. 3
(b) Why cellular system use different frequency band for uplink and downlink? 3
For the data stream 10010011, draw the graph for the following line coding schemes: 4
(c) i. 2B1Q
ii. MLT-3

Section-B

- Q.5 (a) In the optical fiber communication, how step index differ from graded index? 3
(b) Four channels, two with a bit rate of 600 kbps and two with a bit rate of 500 kbps, are to be multiplexed using multiple slot TDM with no synchronization bits, Answer the following questions:
i. What is the size of a frame in bits?
ii. What is the frame rate?
iii. What is the duration of a frame?
iv. What is the data rate? 3
(c) What do you understand by propagation and transmission delay and latency? 3
- Q.6 (a) Five channels, each with a 100-kHz bandwidth are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 kHz between the channels to prevent interference? 5
(b) Distinguish between baseband transmission and broadband transmission. 3
(c) We want to digitize the human voice. What is the bit rate, assuming 8 bits per sample? 2
- Q.7 (a) Briefly describe the pulse code modulation (PCM) technique. 2
(b) What is pulse rate and bit rate? Show the relation between them. 3
(c) For the bit stream 01011001, sketch the waveforms for NRZ-I and NRZ-L encoding format. 5
- Q.8 (a) We have an available bandwidth of 100 kHz which spans from 200 to 300 kHz. What should be the carrier frequency and the bit rate if we modulated our data by using FSK with $d = 1$? 4
(b) What are the advantages of QAM over ASK or PSK? 3
(c) Find the bandwidth for a signal transmitting at 12 Mbps for QPSK. The value of $d=0$. 3

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

4th Year 1st Semester Final B.Sc. Engineering Examination-2021**Course Code: CSE403****Course Title: Computer Simulation and****Modeling****Total Marks: 60****Time: 3 (Three)****Hours****N.B.:**

- i. Answer **SIX** questions taking any **THREE** from each section.
- ii. All parts of a question must be answered sequentially.

Section-A

1. a) Distinguish between Bernoulli and Binomial distribution. 3
- b) For the time-shared computer model with service quantum of length $q = 0.05$ second and swap time $\tau = 0.01$ second, simulate the computer system for 4 jobs from 3 terminals where 1st terminal has job no. 1 and 4. Each job arrives after the ‘think’ time of the operator. The think time and service time of each job are listed below: 7

Job	Think Time	Service Time
1	0.0	0.2
2	0.01	0.15
3	0.06	0.1
4	0.2	0.08

Calculate the average response time and average number of job in queue.

2. a) What is data modeling? Write down some data modeling techniques with examples. 6
- b) Consider the following information about a university database. Each project is managed by one professor (known as the project's principal investigator). Each project is worked on by one or more professors (known as the project's co-investigators). Professors can manage and/or work on multiple projects. Each project is worked on by one or more graduate students (known as the project's research assistants). When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one. Departments have a professor (known as the chairman) who runs the department. Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take. Now design the conceptual data model of the system. 4
3. a) The occurrences of demand in an inventory system which follows a policy $(S, s) = (5, 3)$ are listed below: 8

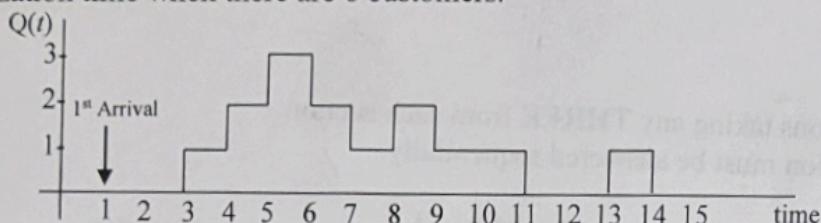
Month	0.6	0.9	1.2	1.9	2.1	2.4	2.5	2.6	2.9
Demand Size	4	3	2	3	1	2	3	3	4

Initial inventory level is 4. If order is placed in the end of a month, it arrives after 0.45 month.

- i. Find the average holding cost after 3 months where holding cost for each item per month is \$12.
 - ii. Find the average backlog cost after 3 months where backlog cost for each item per month is \$30.
- b) Find Z_{1030} from the recursive formula $Z_i = 7Z_{i-1} + 13 \bmod 32$, where $Z_0 = 5$. 2
4. a) Define simulation. Explain when simulation is the appropriate tool and when it is not? 4
- b) Explain the steps of simulation study with appropriate flowchart. 4
- c) Distinguish between Monte-Carlo and Stochastic simulation. 2

Section-B

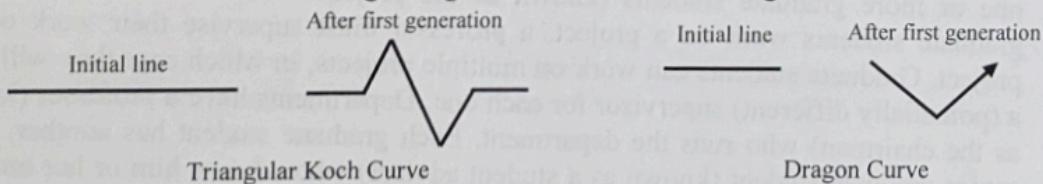
5. For the following graph which indicates the number of customers in queue against time, 10 determine the average number of customers in queue, average waiting time and average utilization time when there are 6 customers.



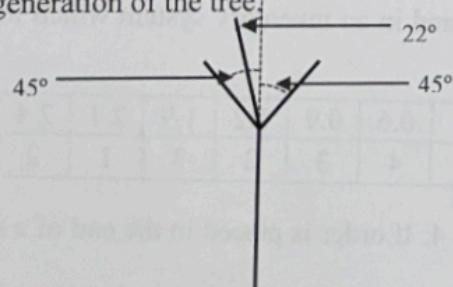
6. a) Explain different techniques for verification of a model. 7
 b) What is model? Discuss various types of model. 3
7. The normal duration and the crash time of different activities are listed below : 10

Activity	Normal Time	Crash Time	Cost Slope
1-2	6	6	-
1-3	5	5	-
1-4	5	5	-
2-5	3	3	-
3-5	4	4	-
3-6	5	4	40
4-6	3	3	-
5-7	4	3	60
6-7	4	3	60

- i. Find the critical path of the PERT Network.
 ii. Crash the project and find total cost where direct cost is \$250 and indirect cost is \$15.
8. a) Derive the formula of finding the dimension of fractal. Then using the formula find the dimension of the following triangular Koch curve and Dragon curve. 6



- b) For the following fractal tree of first generation, construct the string production rules and draw the second generation of the tree. 4



- i. Answer SIX questions, taking any THREE from each section.
- ii. All questions are of equal values

Section A

1. a) What is digital signal processing? Write some application of digital signal processing. 3
- b) Sketch the continuous time signal $x(t) = \sin 7t + \sin 10t$ for an interval $0 \leq t \leq 2$. Plot the corresponding discrete-time signal with a sampling period $T=0.2s$. 3
- c) Briefly explain invertible, non-invertible, time-invariant and time variant system. 4
2. a) Define impulse and unit step signal. 2
- b) Distinguish between cross-correlation and autocorrelation. 2
- c) Determine if the systems described by the following equations are causal or non-causal 3
 - (i) $y(n)=x(n)+\frac{1}{x(n-1)}$ (ii) $y(n)=x(n^2)$
- d) Check whether the given systems are time-invariant or time variant 3
 - (i) $y(n)=x(n)+x(n-1)$ (ii) $y(n)=x(-n)$
3. a) Define Z-transform. Why it is necessary? 3
- b) Find the convolution of the following sequence $x(n) = (1,2,-1,1)$, $h(n) = (1, 0, 1, 1)$ 3
- c) What is the relation between fourier transform and z transform? 2
- d) Find the z-transform of the sequence $x(n) = \{2, 1, -3, 4, 3, 0, 9, 7, 6\}$ 2

↑
4. a) What is Region of convergence? State the properties of Region of convergence 3
- b) Determine the z-transform of the following signal 4
 - (i) $x(n)=(1/3)^{n-1} u(n-1)$ (ii) $x(n)=na^n u(n)$
- c) Explain any two property of z-transform. 3

Section B

5. a) What are magnitude and phase angle of twiddle factor? 2
- b) Determine the 8 point of DFT of the sequence $x(n)=\{1,1,1,1,1,1,0,0\}$ 6
- c) What are the advantages FFT over DFT? 2
6. a) What is FFT? Why FFT is needed? 3
- b) Distinguish between Fourier series and Fourier transform. 2
- c) Find the DFT of a sequence $x(n)=\{1,2,3,4,4,3,2,1\}$ using DIT algorithm. 5
7. a) What are Twiddle factors of the DFT? 2
- b) Draw the butterfly operation in DIT and DIF algorithm? 2
- c) Explain the bit-reversal technique in DIT algorithm. 3
- d) Find the DFT of a sequence $x(n)=\{0,1,2,3\}$ using DIF algorithm. 3
8. a) Write down the general purpose of using digital filters. 3
- b) Distinguish between FIR and IIR filter. 3
- c) Find the inverse z-transform of $X(z)=\frac{z}{(z-3)(z-4)}$ using long division technique where $|z|<3$ 4