Bismillahir Rahmanir Rahim

International Islamic University Chittagong

Department of Computer Science & Engineering

B. Sc. in CSE Final Examination, Autumn 2022

Course Code: CSE 2321 Course Title: Data Structures

Total marks: *50* *Time: 2 hours 30 minutes*

[Answer *all* the following questions. Figures in the right hand margin indicate full marks. Use a Separate answer script for Group-A and Group-B.]

Group A

			CO	DL
1. a)	Let B be an integer array with N elements. Suppose Y is an integer function defined by	2	CO4	C5

$$Y(K)=Y(B,N,K)=\begin{cases}0 & IF\ K=0\\ Y(K-1)+B(K) & IF\ 0<K\le N\\ Y(K-1) & IF\ K>N\end{cases}$$

Find Y(5) for each of the following array:

i. N=8, B: 3,7,-2, 5, 6, -4, 2, 7 ii. N=3, B: 2, 7, -4

b)	Find the value of A(2,2) using the definition of Ackermann function.	5	CO4	C5

OR

b)	Find the value of factorial five (5!) using recursion. Show each step and also show the status of stack that is used in recursion.	5	CO4	C5
c)	Suppose a queue is maintained by a circular array QUEUE with N=12 memory cells. Find the number of elements in QUEUE if i) FRONT =5, REAR=10 ii) FRONT =12, REAR=3 and iii) FRONT =6, REAR=6	3	CO4	C5

2. a)	What is *linked list*? What are the advantages and disadvantages of linked list over the linear array.	2	CO1	C1

OR

What is *circular header list*? Write the advantages of circular header list over ordinary linked list.

b)	Let LIST be a *sorted* linked list. Write an algorithm to *search* an element from the LIST.	3	CO3	C2

OR

Let LIST be a *linked list* of integers in memory. Write a procedure to find the *maximum* MAX of the values in LIST.

c)	Given is the following sorted linked list where the array **INFO** contains a list of integer numbers and **LINK, START** and **AVAIL** are the pointer fields-	2	CO1	C2

	1	2	3	4	5	6	7	8	9	10	11	12
INFO:			41	129		9	123	78	194	231	62	145
LINK:	2	5	11	12	0	3	4	7	10	6	8	9

START : 6 AVAIL : 1

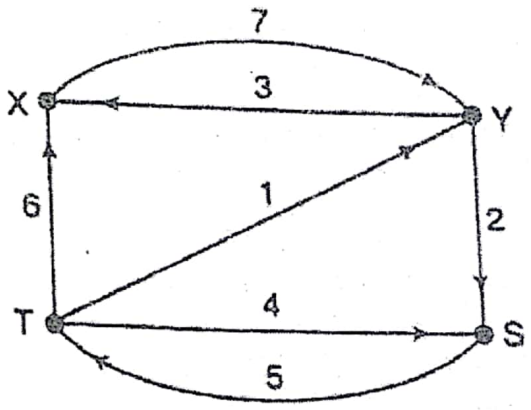
Determine the changes in the list if number XX is *added* to the list and then 194 is *deleted* from the list.
[Here XX is the last two digits of your ID]

d)	What is *two way linked list*? Form a *two way list* from the one way list in Q 2(c).	3	CO1	C3

Group B

3. a)	Suppose the following numbers are stored in an array A: **22, 33, 29, 49, 21, 57, 62, 73, 54, 44** Apply ***selection sort*** algorithm to sort the array A and show each pass separately.	3	CO3	C2
b)	Consider a situation where *swap* operation is very costly. Which of the following sorting algorithms should be preferred so that the number of swap operations are minimized in general? Why? i) Heap Sort ii) Selection Sort ii) Insertion Sort iv) Merge Sort	1	CO4	C4
c)	Write an algorithm to sort an array A of n elements using *insertion sort*.	3	CO1	C2
d)	The following values are to be stored in a **hash table:** **25, 42, 96, 101, 102, 162, 197, 2XX** Describe how the values are hashed by using *division method* of hashing with a *table size* of **11**. Use **linear probing** as the method of *collision resolution*. **[Here XX is the last two digits of your ID. For example, if ID is C191085, 2XX will be 285].**	3	CO3	C3
4. a)	Consider the algebraic expression $E = (3m + n)(5x - y)^3$. a) Draw the tree T which corresponds to the expression E. b) Find the *preorder* and *postorder* of T.	3	CO1	C2
b)	The *preorder* traversal sequence of a *binary search tree* is **30, 20, 10, 15, 25, 23, 39, 35, 1XX.** Draw the tree. Show each step. **[Here XX is the last two digits of your ID. For example, if ID is C191085, 1XX will be 185].**	3	CO1	C2
c)	What do you mean by *max heap*? Build a max heap from the following list of numbers: **30, 39, 29, 27, 37, 52, 63, 44**	3	CO1	C2
d)	Explain which data structure is most efficient to find the *top 10 largest items* out of *1 million items* stored in file? Why? i) Min heap ii) Max heap iii) BST iv) Sorted array	1	CO4	C4
	OR			
4. a)	Suppose the following nine numbers are inserted in order into an empty binary search tree T: 50, 33, 44, 22, 77, 35, N, 60, 40, i. Draw the tree T. ii. Traverse the tree T in **preorder, postorder** and **inorder.** (Note: *N is the last two digits of your ID. i.e. if your ID is C151216, then N=16)*	5	CO1	C2
b)	Illustrate the operation of Heap sort on the array A=(5,13,2,25,N,7,17,20,8,4). (Note: *N is the sum of last two digits of your ID. i.e. if your ID is C151216, then N=1+6=7)*	5	CO4	C2
5. a)	Describe the adjacency list and linked representation of graph with necessary figure.	5	CO3	C1
b)	Consider the following weighted graph. Suppose the nodes are in an array DATA as follows:	5	CO4	C2

Data: X, Y, S, T



Find the weighted matrix W of the weighted graph. Than find Q_0 and Q_1 from W using Warshall's algorithm.

International Islamic University Chittagong

Department of Computer Science and Engineering

B Sc. in CSE, Final Examination, Autumn 2022

Course Code: CSE-2323 Course Title: **Digital Logic Design**

Time: 2 hours 30 minutes Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

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Group A

[Answer the questions from the followings]

1.	a)	Convert SR to T Flip-flop. Convert JK to SR, T to SR, and D to SR Flip-flop. Define the basic difference between Latch & Flip Flop.	CO2	A	5
		Or,			
1.	a)	Design an asynchronous ripple-down counter.	CO2	A	5
1.	b)	Design a J-K flip-flop and show its truth table, characteristic table, excitation table, and logic diagram.	CO1	U	5
2.	a)	Design a modulo counter by asynchronous counter.	CO2	U	5
2.	b)	Design a 5X32 decoder with four 3x8 decoders and a 2x4 decoder. Use a block diagram.	CO3	A	5
		Or,			
2.	b)	Design a circuit that compares two 3-bit numbers, A and B, to check, if they are equal. The circuit has one output x so that x=1 if A=B, and x=0 if A≠ B. Show the output by providing data into the circuit.	CO3	A	5

Group B

[Answer the questions from the followings]

3.	a)	Design a 2 bits synchronous counter by JK Flip Flop.	CO2	A	5
3.	b)	Implement the output Sum of a Half adder by S-R flip flop.	CO3	N	5
4.	a)	Design a counter using SR flip flops with the repeated following binary sequence: 0, 1, 3,2, 6,4,5,7.	CO2	A	5
4.	b)	Design Johnson's counter.	CO3	N	5
5.	a)	Define ROM.	CO1	U	2
5.	b)	Define Moore's state machine with an example.	CO2	A	8
		Or,			
5.	a)	Define register. Define the functions of the universal shift registrar.	CO1	U	2
5.	b)	A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers. How many selection inputs are there in each multiplexer? What sizes of multiplexers are needed? How many multiplexers are there on the bus?	CO2	E	8

International Islamic University Chittagong

Department of Computer Science & Engineering

Program: B.Sc.(Engg.) in CSE

Semester: 3rd

Final Examination, Autumn-2023

Course Code: CSE-2324 **Course Title: Digital Logic Design Sessional**

Time: 3 Hours. **Total Marks: 40**

[N. B: Answer any four questions. Each questions carries 10 marks.]

1. To verify the Demorgan's theorems.
2. To verify the Half Adder & Full Adder
3. To verify the characteristic table of JK, and T Flip flops
4. Study of working principle of 1:4 Demultiplexer using IC-74145
5. To design IC 74193 as a up/down counter
6. Implement BCD to 7- segment Decoder.
7. To design and realize the following using IC 7483. I) BCD to Excess- 3 Code. II) Excess-3 to BCD Code.
8. To realize One & Two Bit Comparator and study of 7485 magnitude comparator.

International Islamic University Chittagong
Center for General Education (CGED)
Semester End Examination, Autumn–2022

Course Code: URED-2302 Course Title: Sciences of Qur'an and Hadith
(For Law faculty: URED-2101)

Full Marks: 50 ***Time: 2:30 Hours***

Answer all questions strictly
(All questions are of equal value)

#	Questions	Marks	CLOs	Bloom's taxonomy domain
1	a) Explain how *Makkai* and *Madani* revelations are defined along with some of their common features. Or, b) "A number of verses may have one *Sababun Nuzul*"- analyze this statement showing the various type of *Asbabun Nuzul* and benefits of knowing them.	10	4	Create
2	Estimate the ways how the holy Qur`an was preserved and compiled in the life time of the Prophet (SAAS) and Abu bakr (R).	10	3	Evaluate
3	Explain some scientific indications of the holy Qur'an proving it as the best miracle of Prophet Muhammad (SAAS) with proper evidence.	10	3	Create
4	Explain the necessity of Hadith in our life mentioning the definition of Hadith literally and terminologically.	10	4	Create
5.	a) Explain Al-Hadith Al-Qudsi, Al-Hadith Al-Mawdu`, Six books of Hadith, and *Sanad-Matan* with examples. Or, b) "All Ahadith (Hadith) which are available in our society are authentic"- evaluate this statement explaining some types of Hadith according to the reliability, authenticity, and memory of the reporters of Hadith.	10	4	Evaluate & Create

International Islamic University Chittagong
Morality Development Program
Semester End Examination, Autumn-2022
3rd Semester *(for Muslim Students only; other than Shari'ah faculty)*
Course code: MDP-2303
Course Title: *Tajweedul Qur'an*-III (Arts of correct recitation of the Qur'an)
Full Marks: 50 Time: 2:00 Hours

Answer any Five (5) of the following questions
(All questions are of equal value)

1. Write the meaning of the following Surah **(any two):**
   a) *Surah At-Tin* (سورة التين);
   b) *Surah Ash-Sharh* (سورة الشرح);
   c) *Surah Ad-Duha* (سورة الضحى).

2. Define *At-Tafkhim* and *At-Tarqiq* (Valorization & Attenuation). Identify *At-Tafkhim* and *At-Tarqiq* in the following Arabic Letters mentioning the reasons.

a	B	c	d	e	F	g	h	i	j
ب	ج	خ	ص	ض	ط	ظ	ع	غ	ق

3. How do you recite *Alif* of *Madd*, and *Laam* of the word Allah? Identify *At-Tafkhim* and *At-Tarqiq* in the following Arabic words and sentences mentioning the reasons.

a	b	C	D	e
اللّٰه	بِسْمِ اللّٰهِ	لقد خلقنا الإنسان	وعملوا الصّالحات	رَسُوْلُ اللّٰهِ

4. "*Al-Waqf* helps us to recite the holy Qur'an precisely"- evaluate this statement explaining the definition and different types of *Al-Waqf* with examples.

5. Suppose, you decided to perform *Salatul Eid* (Eid prayer), how will you perform it? Explain it mentioning its impact on your life.

6. "Some Muslims don't know how to perform *Salatul Janazah* (Funeral Prayer) properly"- justify this statement explaining the system of performing *Salatul Janazah* from the viewpoint of Islam.

7. "My servant continues to draw close to Me with *Al-Nawafil* (supererogatory prayers) so that I may love him"- explain this *hadith* summarizing some voluntary prayers and their importance in Islam.

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE

Final Exam, Autumn 2022

Course Code: **STAT 2311** Course Title: **Probability and Statistics**

Time: 2 hours 30 minutes Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

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Part A

[Answer the questions from the followings]

1.	a)	Define Karl Pearson correlation coefficient. Write down the properties of correlation coefficient. Interpret the following correlation coefficients: (i) r = 0; (ii) r = -0.8; (iii) r = 1; (iv) r = 1.90	CO2	An	4
		Or			
	a)	Compare and contrast between correlation and regression. Mention some properties of regression coefficient.	CO2	An	4
1	b)	The age and height (in inches) of 6 football players in Brazil are as follows:	CO2	E	6

Players	Vini Jr.	Neymar	Casemiro	Jesus	Antony	Alves
Age(x)	22	30	30	25	22	39
Height (y)	70	69	71	67	71	73

(i) Create a scatter plot between age and height of a players.

(ii) Compute karl pearson correlation coefficient between age and heights of players.

Or,

	b)	The following data refer to information about annual sales (Tk.'000) and year of experience of a super store of 8 salesmen:	CO2	E	6

Salesmen	1	2	3	4	5	6	7	8
Annual sales (Tk.'000)	90	75	78	86	95	110	130	145
Year of experience	7	4	5	6	11	12	13	17

(i) Fit two regression lines.

(ii) Estimate sales for year of experience is 10

(iii) Estimate year of experience for sales 100000

2	a)	Explain the followings with example: (i) Sample point; (ii) Simple event; (iii) Probability and (iv) Dependent event.	CO3	U	4
2	b)	State Bayes theorem. 55% of the population in Chattogram city moves by bus 30% by own car and 15% by rickshaw. 1% of the accident committed by bus, 3% by rickshaw and 4% by own car. A person of the city falls in an accident. What is the probability that the accident was committed by the (i) own car; (ii) bus or rickshaw.	CO3	AP	6

Part B

[Answer the questions from the followings]

3. a) Define random variable with example. How do you distinguish a discrete and continuous random variable? Write down the condition of probability function and probability density function. CO3 An 4

Or

a) Define Mathematical Expectation. Write down the Properties of mathematical expectation and variance of a random variable CO3 An 4

3. b) Let x be a continuous random variable with density function CO3 E 6

$$f(x)=\frac{x}{k};\ 2<x<8$$

Find (i) the value of 'K' ; (ii) $P(x < 4)$ and (iii) $P(3 < x < 6)$

Or,

b) Suppose that in a certain region of a country the daily rainfall (in inches) is a continuous random variable X with probability density function f(x) given by CO3 E 6

$$f(x) = kx^2 ; 0 \le x \le 1$$

Find the value of 'k' and also find the probability that at a given day in this region the rainfall is (i) not more than 0.5 inches. (ii) between 0.5 and 0.9 inches. Also calculate mean and variance of the daily rainfall (in inches).

4. a) Define poisson and normal distribution. Write some practical situations suitable for poisson distribution. Discuss the importance of normal distribution in engineering field. CO3 U 4

4. b) In a community, the probability that a newly born child will be boy is 1/2. Among the 4 newly born children in that community, what is the probability that (i) at least two boys (ii) no boys (iii) exactly one boy and (iv) at most two boys. CO3 E 6

5. a) Explain Level of significance and P-Value. Write some applications of χ^2-test? CO4 An 4

5. b) A random sample of 1190 people was surveyed and each person was asked to report the highest education level they obtained. The data that resulted from the survey is summarized in the following table: CO4 C 6

	Bachelors	Masters
Female	250	240
Male	344	356

Compute the value of Chi-square for the above data and comment.

International Islamic University Chittagong
Department of Computer Science & Engineering
Final Examination, Semester: Autumn 2022
Course Code: CHEM-2391, Course Title: Chemistry

Full Marks: 50 **Time: 2 Hours 30 Minutes**

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

				CO	DL
		Group - A			
1.	a.	What are ideal and real solutions? Explain the causes of the non-ideality of solutions.	5	CO1	C2
	b.	What are colligative properties? When are the laws on colligative properties valid?	5	CO1	C2
2.	a.	Define electrolytes and nonelectrolytes. How would you differentiate between electrolytes and nonelectrolytes?	5	CO1	C2
	b.	Mention some roles of electrolytes in the body.	2	CO1	C1
	c.	Differentiate between Ionization and Dissociation.	3	CO2	C2
	OR				
2	a.	State and explain Nernst distribution law with limitations and applications.	4	CO1	C1
	b.	Define the following concentration terms- i. Mole fraction ii. Percent solution	3	CO1	C1
	c.	State and explain Henry's law with limitations and applications.	3	CO2	C2
		Group - B			
3.	a.	What is Chemical equilibrium? Write the characteristics of Chemical equilibrium.	5	CO1	C1
	b.	What is La Chatelier's principle? Distinguish between homogeneous and heterogeneous equilibrium.	5	CO2	C3
4.	a.	What is the differences between the order and molecularity of a reaction?	3	CO1	C2
	b.	Define zero-order reaction and Pseudo-unimolecular reaction with examples.	3	CO1	C1
	c.	Prove that $K = \frac{1}{t}\frac{x}{a(a-x)}$ Where the symbols have their usual meanings.	4	CO2	C5
	OR				
4.	a.	Define colloid. What do you mean by dispersed medium and dispersed phase?	3	CO1	C2
	b.	Classify colloidal solutions based on dispersed medium and dispersed phase and give examples.	4	CO1	C1
	c.	Discuss the difference between Lyophilic sol and Lyophobic sol.	3	CO2	C2
5.		Write short notes on the following (any two)	10		
	a.	a) Transition state theory; b) Collision theory; c) Arrhenius theory of electrolyte conductance.		CO1	C1