

International Islamic University Chittagong
Center for General Education (CGED)
 Semester End Examination, Autumn-2023

Course Code: URED-2302 (URED-2101 for LLB)
Course Title: Sciences of Qur'an and Hadith

Full Marks: 50

Time: 2 Hours 30 Minutes

(Answer all questions; the columns on the right side indicate to the marks, CLOs, and Bloom's taxonomy domain for each question):

#	Questions	Marks	CLOs	Bloom's taxonomy domain
1	<p>a) "There are various opinions regarding the numbers of <i>Makki</i> and <i>Madani</i> suar (chapters)"- explain this statement summarizing the basic features of <i>Makki</i> and <i>Madani</i> suar (chapters).</p> <p style="text-align: center;">Or,</p> <p>b) Define <i>Naskh</i> (Abrogation) literally and terminologically. Explain the various classifications of <i>Naskh</i> in the holy Qur'an and Hadith with examples.</p>	10	3	Evaluate& Create
2	Explain the role of Abu Bakr (ra) and Uthman (ra) to compile and preserve the holy Qur'an in its original form. Identify the difference between their contributions.	10	3	Analyze& Create
3	Illustrate different types of miracles of the holy Qur'an proving the holy Qur'an as the best miracle of Prophet Muhammad (SAAS).	10	3	Understand & Evaluate
4	Explain the necessity of Hadith in our life showing the difference between the Qur'an and Hadith from the viewpoint of the sciences of Hadith.	10	3	Evaluate & Create
5.	<p>a) Define Hadith literally and terminologically. Explain types of Hadith according to the number of reporters are involved in each stage of <i>Sanad</i>.</p> <p style="text-align: center;">Or,</p> <p>b) Explain with examples:</p> <ul style="list-style-type: none"> • <i>As-Sanad&Al-Matan</i>; • <i>Al-Hadith As-Sahih</i>; • <i>Al-Hadith Al-Qudsi</i>; • <i>Al-Hadith Al-Mawdu'</i>, • <i>Six books of Hadith</i>. 	10	3	Remember &Create Create

International Islamic University Chittagong

Morality Development Program

Semester End Examination, Autumn-2023

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 hours &30 minutes

Answer all questions; all questions are of equal value;

1. Write the meaning of the following Surah: (Any two)

a) Surah At-Teen (سورة التين);

b) Surah Al-Inshirah (سورة الانشراح);

c) Surah Ad-Dhuha (الضحى).

2. a. Define Tafkheem (Velarization) and Targeek (Attenuation). How many letters of Tafkheem are there in Tajweed? Explain the rules of Raa (ر) and Laam (ل) in the name of Allah.

Or,

b. Define Al-Waqf (الوقف). Explain some types of Waqf from the viewpoint of Tajweed with examples.

3. a. How to perform Salatul Janazah (Funeral Prayer)? Describe it in some details.

Or,

b. Explain briefly some types of Voluntary Prayers mentioning their importance in Islamic Shari'ah.

4. Explain some biographies of Muslim heroes and Muslim scholars who have extraordinary contributions to the history of Islam.

5. Explain some scientific indications of the holy Qur'an with examples.

International Islamic University Chittagong
 Department of Computer Science and Engineering
 B. Sc. in CSE Semester Final Exam, Autumn 2023

Course Code: STAT 2311

Time: 2 hours 30 minutes

Course Title: Probability and Statistics

Full Marks: 50

The figures in the right-hand margin indicate full marks.

Course Outcomes and Bloom's Levels are mentioned in additional columns

Part A

[Answer the following questions in the designated answer script.]

- 1 a) Define correlation with example. A researcher computes the correlation coefficient between two variables and gets $r = -1.02$. What does this value mean? Interpret the followings about correlation coefficient r : CO2 U 4

(i) $r = -0.87$ (ii) $r = 0.3$ (iii) $r = 0$ (iv) $r^2 = 0.8$.

Or What are the fundamental assumptions of linear regression? Which regression techniques are commonly used in the field of data science?

- 1 b) Programmer A and Programmer B are working on a software project. The CO2 C 6 number of lines of code they write per day for 6 days is as follows:

Programmer A: [50, 60, 45, 55, 70, 65]

Programmer B: [45, 55, 50, 60, 65, 70]

- i. Calculate the Pearson correlation coefficient between the productivity of Programmer A and Programmer B based on the number of lines of code they write each day and comment on your result.

- ii. Draw a scatter diagram to represent the above information.

Or An article in the IEEE Transactions on Instrumentation and Measurement described the use of a simple linear regression model to express drain current y (in milliamperes) as a function of ground-to-source voltage x (in volts). The data are as follows:

y	0.67	0.86	1.04	1.19	1.35	1.50	1.66	1.7
x	1.0	1.1	1.3	1.4	1.5	1.6	1.7	1.8

- i. Fit a simple linear regression model to these data.

- ii. Estimate the value of y when voltage $x = 2.8$.

- 2 a) Explain the terms: (i) *axiomatic probability*; (ii) *sample space* (iii) *random experiment*; and (iv) *dependent events*. CO3 R 4

- 2 b) State Bayes theorem. In a manufacturing company, three different factories, Plant-I, Plant-II, and Plant-III, are involved in producing electric bulbs. Plant-I contributes 45% of the total production, Plant-II contributes 35%, and Plant-III contributes 20%. Historical data reveals that 3% of the bulbs from Plant-I are defective, 2% of the bulbs from Plant-II are defective, and 1% of the bulbs from Plant-III are defective. If you randomly select a bulb from the daily production, calculate the probability that (i) it comes from Plant-I, (ii) it originated from Plant-III.

Part B

[Answer the following questions in the designated answer script.]

3. a) What criteria must be met for a function to be considered a *probability density function*? Define mathematical expectation of a random variable. CO3 U 3 Write down its properties.

Or Distinguish between discrete and continuous random variables. Write down the properties of the variance of a random variable.

3. b) Suppose that in a certain region of a country the daily rainfall (in inches) is CO3 E 4

a continuous random variable X with probability density function given by

$$f(x) = \frac{3}{12} (6x - 3x^2), \quad 0 < x \leq 2 \text{ (inches)}$$

Find the probability that on a given day in this region the rainfall is

- not more than 1.6 inches.
- between 0.4 and 1.7 inches.

Or A continuous random variable X has the following probability density function:

$$f(x) = \frac{3}{4} (2x - x^2), \quad 0 < x < 2$$

Compute (i) $\Pr[X < 1.5]$ and (iv) $\Pr[X > 0.4]$

3 c) A continuous random variable X has the following probability density function: CO3 E

$$f(x) = K(x - 1), \quad 2 < x < 6$$

Compute the value of K first and then find $E[X]$.

4. a) Under what conditions *binomial distribution* reduces to *Poisson distribution*? CO3 U 3

Or, State the conditions under which a *binomial distribution* can be approximated as a *normal distribution*.

4. b) The phone lines to an airline reservation system are occupied 40% of the time. Assume that the events that the lines are occupied on successive calls are independent. Consider, for the following questions, that 10 calls are placed to the airline. CO3 E 5

- What is the probability that for exactly three calls the lines are occupied?
- What is the probability that for at least one call the lines are not occupied?
- What is the expected number of calls in which the lines are occupied?

4. c) What are the inherent assumptions of the *binomial distribution*? CO1 R 2

5. a) Distinguish between the followings: CO4 U 4

- Type I error and Type II error
- Level of significance and P-Value

5. b) A network administrator wants to determine if there is an association between the type of network issues (connectivity or latency) and the time of day (morning or evening). The administrator collects data on network incidents over a month and constructs a 2×2 contingency table as follows: CO4 C 6

	Connectivity	Latency
Morning	55	25
Evening	30	40

Conduct a chi-square test at a 5% significance level to assess whether the type of network issue is related to the time of day.

(At 5% level of significance tabulated value of Chi-square @ 1df = 3.84).



International Islamic University Chittagong (IIUC)
Department of Computer Science and Engineering (CSE)
Semester Final Examination

Program: B. Sc. in CSE
Course Code: MATH-2307
Time: 2:30 hours

Semester: Autumn-2023
Course Title: Mathematics-III
Total Marks: 50

- (i) Answer all the questions. The figures in the right-hand margin indicate full marks.
- (ii) Please answer the several parts of a question sequentially.
- (iii) Separate answer script must be used for separate group.
- (iv) Course Learning Outcomes (CLOs) and Bloom's Levels are mentioned in additional Columns.

Course Learning Outcomes (CLOs) of the Questions

CLO1:	Understand the fundamentals of Matrix, Linear system of equations & Vector analysis.
CLO2:	Implement the fundamental knowledge of Matrix, linear system of equations, vector functions, vector field, scalar field, gradient, divergence, curl, differentiation and integration of vector valued functions, partial derivatives in different problems.
CLO3:	Solve line integrals, surface area, surface integrals, volume integrals, and the work done in different problems.
CLO4:	Apply Green's theorem, Stoke's theorem, and Gauss' theorem in solving mathematical problems and MATLAB

Bloom's Taxonomy Domain Levels of the Questions

Letter Symbols	R	U	Ap	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Group-A

	Marks	CLO	DL
1. a) Using LU decomposition solve the following linear system of equations, $x + 2y + 3z = 5, 2x - 4y + 6z = 18, 3x - 9y - 3z = 6$	8	CLO1	R&U
b) Write MATLAB command that returns (a) two random matrices A and B (b) inverse of A and B	2	CLO4	App
2. a) If $\vec{a} \cdot \vec{b} = \sqrt{3}$ and $\vec{a} \times \vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$, find the angle between \vec{a} and \vec{b} Or If $\phi(x, y, z) = xy^2z$ and $\vec{A} = xz\hat{i} - xy^2\hat{j} + yz^2\hat{k}$, then find $\frac{\partial^2}{\partial x \partial z}(\phi\vec{A})$ at the point $(2, -1, 1)$	4	CLO2	R&U
b) On which condition of λ the vectors $\hat{i} + 2\hat{j} + 3\hat{k}, \lambda\hat{i} + 4\hat{j} + 7\hat{k}, -3\hat{i} - 2\hat{j} - 5\hat{k}$ are collinear and hence determine the vectors are coplanar or not Or A particle moves so that its position vector is given by $\vec{r} = \cos\omega t \hat{i} + \sin\omega t \hat{j}$; where ω is a constant. Show that, (i) The velocity v of the particle is perpendicular to r , (ii) The acceleration a is directed toward the origin and has magnitude proportional to the distance from the origin. (iii) $r \times v = \text{a constant vector.}$	6	CLO2	R&U

Group -B

- | | Marks | CLO |
|--|-------|------|
| a) Suppose that over a certain region of space the electrical potential V is given by $\phi(x, y, z) = 5x^2 - 3xy + xyz$
Find the rate of change (derivative) of the potential at P(3,4,3) in the direction of the vector $\vec{v} = \hat{i} + \hat{j} - \hat{k}$ | 4 | CLO2 |
| Or | | |
| • Find all vectors \vec{v} such that $(\hat{i} + 2\hat{j} + \hat{k}) \times \vec{v} = 3\hat{i} + \hat{j} - 5\hat{k}$ | 4 | CLO2 |
| b) If $\vec{F} = xy\hat{i} - z\hat{j} + x^2\hat{k}$ and C is the curve $x=t^2, y=2t, z=t^3$ from $t=0$ to $t=1$, then evaluate the line integral, $\int_C \vec{F} \cdot d\vec{r}$ | 6 | CLO3 |
| Or | | |
| • Find the work done in moving a particle once around a circle C in xy plane, where the circle has center at the origin and radius 3 and the force field is given by $\vec{F} = (2x - y + z)\hat{i} + (x + y - z^2)\hat{j} + (3x - 2y + 4z)\hat{k}$ | 6 | CLO3 |
| a) If $\vec{F} = 2y\hat{i} - z\hat{j} + x^2\hat{k}$ and S is the surface of the parabolic cylinder $y^2 = 8x$ in the first octant bounded by the planes $y = 4$ and $z = 6$.
Evaluate $\iint_S \vec{F} \cdot \hat{n} ds$ | 8 | CLO4 |
| b) Write three alternative MATLAB commands to create a vector from 0 to 100 with step size 5 | 2 | CLO4 |
| Verify the divergence theorem for the vector field $\vec{F} = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$ taken over the region bounded by the planes, $x = 0, x = 2; y = 0, y = 2; z = 0, z = 2$ | 10 | CLO4 |

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 16
 16
 3

International Islamic University Chittagong
Department of Computer Science and Engineering
Final Examination, Autumn 2023

Course Code: CSE 2323
Total Marks: 50

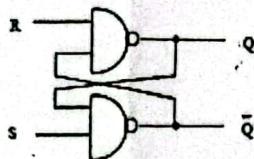
Course Title: Digital Logic Design
Time: 2 hours 30 minutes

[The figures in the right-hand margin indicate full marks. Course Outcomes and Bloom's Levels are mentioned in additional columns.]

Group-A

[Answer the questions from the followings. Parts of the same question must be answered serially.]

1. a) The figure below shows an RS latch made out of NAND gates (rather than NOR gates). How do Q and Q' (Prime) depend on the RS inputs? i.e. verify that the circuit can indeed be used as a RS latch. CO2 A 5



Or,

1. a) Design a SR Flip Flop using NAND gate. CO2 A 5
1. b) Write down the steps associated for SR to D Flip Flop conversion with proper circuit diagram. CO1 U 5

2. a) What do you mean by race condition? How to differentiate between flip-flop and latch? CO2 U 5
2. b) How does JK flip-flop remove the indeterminate states of S-R flip-flop? Design a JK flip-flop and show its characteristic equation, characteristic table, logic diagram and timing diagram. CO3 A 5

Or

2. b) Describe the operation of master-slave D flip-flop with logic diagram and characteristic table. CO3 A 5

Group-B

3. a) Design a counter with the following binary sequence: 0, 4, 2, 1, 6 and repeat. Use D flip-flops. CO2 A 5
3. b) Design BCD counter with proper timing diagram. What do you mean by shift registers? Mention the different types of shift register. CO3 N 5
4. a) Design the sequential circuit described by the following state equations using JK flip-flops. CO2 A 5
- $$A(t+1) = xAB + yA'C + xy$$
- $$B(t+1) = xAC + y'BC'$$
- $$C(t+1) = x'B + yAB'$$
4. b) Differentiate between sequential circuit and combinational circuit. CO3 A 5

5. a) Using sequence generator generates sequence of 11010 and also draw proper circuit **CO1 U 5**
diagram.

Or,

5. a) State the characteristics of register. To hold data for longer duration which terminal
is used? Define the types of load in register. What are the two types of data format
used in register? **CO1 U 5**
5. b) If counter is having 10FF. It is initially 0. What count will it hold after 2060 pulses? **CO2 A 5**
Design D latch with truth table and proper circuit diagram.

Or,

5. b) Define coincidence logic with example. Differentiate between PAL and PLA. **A CO2 A 5**
combinational circuit is defined by the functions:

$$F_1(A, B, C) = \sum(3, 5, 6, 7)$$

$$F_2(A, B, C) = \sum(0, 2, 4, 7)$$

Implement the circuit with a PLA having three inputs, four product terms, and two
outputs.

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE Semester Final Examination, Autumn 2023

Course Code: CSE 2321 Course Title: Data Structures

Time: 2 hours 30 minutes

Total marks: 50

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

CO DL

Group A

[Answer the following questions]

- a) Write the two properties of a recursion function. Find the base criteria of the following recursive functions. 3 CO4 CS

i. $H(N) = \begin{cases} 3^N & \text{IF } N < 5 \\ 2 * H(N - 5) + 7 & \text{Otherwise} \end{cases}$

ii. $F(N) = \begin{cases} 1 & \text{IF } N = 0 \\ N * F(N - 1) & \text{IF } N > 0 \end{cases}$

iii. $GCD(A, B) = \begin{cases} GCD(B, A) & \text{IF } A < B \\ A & \text{IF } B = 0 \\ GCD(B, MOD(A, B)) & \text{Otherwise} \end{cases}$

- b) What do you mean by Tower of Hanoi problem? Draw a schematic diagram to solve the Tower of Hanoi problem for n=4 disk. 5 CO4 CS

OR

- b) Find the value of factorial five (5!) using recursion. Show each step and also show the status of stack used in the recursion. 5 CO4 CS

- c) The value of REAR is increased by 1 in case of insertion in queue and the value of FRONT is increased by 1 in case if deletion from queue. Do you agree with this statement and why? 2 CO4 CS

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

OR

- a) What is *circular header list*? Write the advantages of circular header list over ordinary linked list. 2 CO1 CI

- b) You are given a linked list containing an odd number of elements. You don't know how many numbers there are in that list. Write an algorithm or C/C++ code to find the *middle element* of this list. 4 CO3 C2

- b) You are given a two-way linked list containing an odd number of elements. You don't know how many numbers there are in that list. Write an algorithm or C/C++ code to find the middle element of this list by iterating only once over the list. 4 CO3 C2

- c) Consider the *alphabetized* list of patients in Fig-2c. Determine the changes in the data structure if i) Ford is added to the list and then ii) Lane is deleted from the list. 2 CO1 C2

		1	2	3	4	5	6	7	8	9	10	11	12
BfD	Kirk		Dean	Max	Adam		Lane	Green	Samu		Fields	Nelso	
Link	7	6	11	12	3	0	4	1	0	2	8	9	

Fig-2c

- d) A **DEQUE** is a data structure that allows insertion and deletion of elements from both ends that allows the following four operations on it: 2 CO1 C3

1. **PUSH_FRONT(X)**: This function adds an item X in front of its elements.

2. **PUSH_BACK(X)**: This function adds an item X at the end of its elements.

3. **POP_FRONT()**: This function deletes the first element (if there is any).

4. **POP_BACK()**: This function deletes the last element (if there is any).

Suppose you are building a **DEQUE** where the underlying data structure would be a one way linked list. What would be the *time complexity* of these four operations? Explain.

Group B
[Answer the following questions]

3. a) What do you mean by the complexity of algorithms? Analysis the complexity of selection sort algorithm. 5 C
- b) Suppose the following characters are stored in an array A: 5 C
M, U, S, E, U, M
 Apply **selection sort** algorithm to sort the array A and show each pass separately.
4. a) Analyze the differences between Binary tree and Complete binary tree with figure. Construct an expression tree T for the following arithmetic expression: 5 C
 $(A + B * C) + ((D / E - F) * G)$
- Traverse the tree T in **preorder, postorder** and **inorder**.
- b) Suppose the following eight numbers are inserted in order into an empty binary search tree T: 4 C
 50, 23, 44, 22, 77, 35, 60, 40
 Draw the tree T and show each step.
- OR**
- b) What do you mean by **max heap**? Build a max heap from the following list of numbers: 4 C
23, 29, 49, 21, 57, 62, 73, 54
- c) Explain which data structure is most efficient to find the *top 10 largest items* out of *1 million items* stored in file? Why? 1 C
 i) Min heap ii) Max heap iii) BST iv) Sorted array
5. a) What is a **graph**? Consider the following graph G in Fig-5a: 2.5 C

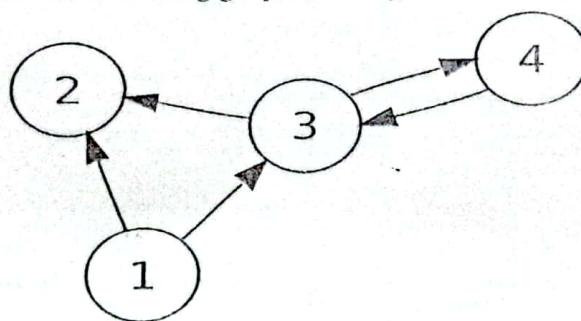
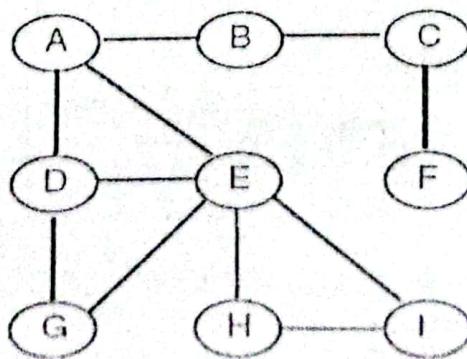


Fig-5a

- a) i) Find the **adjacency matrix A** of the graph G.
 ii) Find the **adjacency list** of the graph G.
- b) Use **Warshall's algorithm** to find the **path matrix** for the graph G in Fig 5a. Show each step. 3.5 C
- OR**
- b) Find the **path matrix** for the graph G in Fig 5a using powers of the adjacency matrix A. 3.5 C
 c) Traverse the graph G shown below in **breadth first order**, **depth first order** and construct the **breadth first** and **depth first spanning trees**. Start from node A [if last digit of your ID is odd] / E [if last digit of your ID is even]. 4 C



International Islamic University Chittagong
Department of Computer Science & Engineering

Final Examination, Semester: Autumn-2023

Course Code: CHEM-2301, Course Title: Chemistry

Section: 3AM, 3BM, 3CM, 3DM, 3EM, 3FM, 3AF, 3BF & 3CF

Time: 2.5 Hours

Full Marks: 50

[N.B: Answer any two from group A and any three from Group B from the followings.
 Figures in right margin indicate marks]

Group - A

1. a. Define colligative properties. What are the colligative properties of dilute solutions? When are the laws on colligative properties valid? 5 CO1 DL C2

- b. State Raoult's law of lowering of vapour pressure. 2 CO2 C4
 What happens to the V.P. (vapour pressure) composition plots if the solution behaves as ideal and non-ideal (positive and negative deviations)? 3

Or
 Why is salt bridge used in electrochemical cell? How is standard hydrogen electrode is constructed?

2. a. Define electrolytes and nonelectrolytes. How would you differentiate between electrolytes and nonelectrolytes? Mention some roles of electrolytes in the body. 4 CO1 C2

Or
 What is *transport number*? Differentiate between *ionization* and *dissociation*.

- b. State and explain Nernst distribution law along with its limitations and applications. 3 CO1 C1

Or
 State and explain Henry's law along with its limitations and applications.

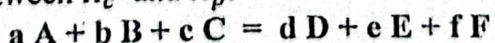
- c. Define the following concentration terms- 3 CO2 C1
 i. Mole fraction ii. Molality

Group - B

3. a. Remark on the types of chemical equilibrium with illustrative examples. 2 CO1 C1

Or
 Explain the notion of reversible reaction.

- b. Using Law of mass action derives an expression for the equilibrium constants K_c and K_p of the following reaction and also find the relationship between K_c and K_p . 6 CO2 C3



- c. State Le Chatelier's Principle. What are the optimum temperature and pressures for maximum production of Ammonia in industry using Le Chatelier's Principle? 2 CO1 C4
4. a. What are the differences between 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 $K = \frac{1}{t^{\alpha(\alpha-x)}}$, where the symbols have their usual meanings. 4 CO2 C5

Or

Write down the Arrhenius's equation, and point out what different parameters used in this equation signify. Briefly remark on the theoretical interpretations of this equation.

5. a. Define colloid. What do you understand by dispersed medium and dispersed phase? 3 CO1 C2

Or

Classify colloidal solutions based on dispersed medium and dispersed phase.

- b. Explain Brownian motion and Tyndall effect. 4 CO1 C1
- c. What are the differences between lyophilic and lyophobic sols? 3 CO2 C2