International Islamic University Chittagong
Center for General Education (CGED)

Midterm Examination: Spring 2025
Course Code: URIH-4701

Program: Undergraduate
Course Title: A Survey of Islamic History & Culture

Time: 1 hours and 30 minutes.

Full Marks: 30

Instructions:
i. All Questions are Compulsory.
ii. Figures in the right margin indicate full marks.
iii. Course Learning Outcome (CLO) and Bloom's levels are mentioned in additional columns.

Bloom's Levels of the Questions.						
Letter of Symbol	R	U	App	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

	Text of the Questions	Marks	Bloom's Level	CLO
1	Elucidate the concept of *khilafah* in Islam. What was the election system to the institution of a *khalifah* during four pious *khalifah* in Islam?	10	U	CLO1
2	Investigate the causes of *Riddah* (Apostasy) War and point out the significant contributions of *Khalifah* Abu Bakr (R) as the savior of Islam.	10	An	CLO3
3	Review the expansion of Islamic territories during the reign of *Khalifah* Umar (R). Or Assess the contributions of *Khalifah* Othman and Ali (R) to the development of Islamic and World Civilization.	10	An	CLO3

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE

Mid term Examination, Spring 2025

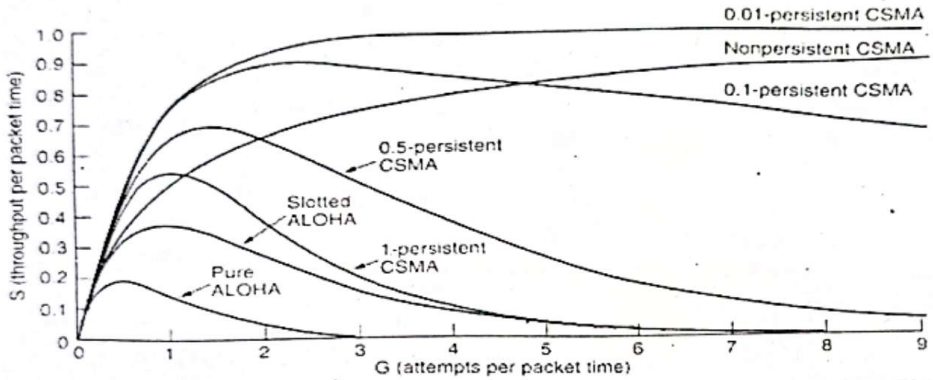
Course Code: **CSE 3633** Course Title: **Computer Networks**

Time: 1 hour and 30 minutes Full Marks: 30

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

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

---

1.	a)	Compare and contrast the TCP/IP reference model with the ATM reference model.	CO1	Un	5
	b)	Analyze the structural differences between the TCP/IP model and the ISO-OSI model. Which model has dominated Modern-day Internet design, and what are the reasons for its dominance?	CO1	Un	5
2.	a)	Evaluate and explain the performance of different medium access control (MAC) protocols based on the given figure. 	CO2	Ev	5
	b)	How can a single broadcast channel be allocated among competing users in a computer network? Also, determine the average delay in a network with a channel capacity of 100 Mbps, an average frame size of 10,000 bits, and a frame generation rate of 5,000 frames per second.	CO2	An	5
		OR			
	c)	Discuss possible solutions to overcome the hidden node and exposed node problems in wireless communication.	CO2	An	5
3.	a)	What are connection-oriented and connectionless services? Compare circuit switching and packet switching, providing examples.	CO1	Un	5
	b)	What are the main differences between IPv4 and IPv6? List three key features of IPv6 that improve upon IPv4. If a company is assigned the IPv6 address block 2001:0db8:1234::/48, how many /64 subnets can it create?	CO4	Un	5
		OR			
	c)	Given the IP address 192.168.100.0/24, create subnets to meet the following requirements: Subnet A – 30 hosts, Subnet B – 20 hosts, Subnet C – 14 hosts and Subnet D – 6 hosts. How many IP addresses are reserved for future use?	CO4	Un	5

International Islamic University Chittagong

Department of Computer Science and Engineering
B. Sc. in CSE
Mid Exam, Spring 2025

Course Code: **CSE 4747** Course Title: **Mathematical analysis for Computer Science**

Time: 1 hours 30 minutes **Full Marks**: 30

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

[Answer the questions from the followings]

1. a) In a hypothetical bee colony, each male bee has one parent (a female), and each female bee has two parents (a male and a female). If you trace the ancestors of a male bee, the number of ancestors in each generation follows the Fibonacci sequence. Let B(n) be the number of bees in the nth generation of this tree. **07**

   Then, B(n) can be represented by the recurrence relation:

   B(n)=B(n−1)+B(n−2) with base cases : B(1)=1, B(2)=1

   Solve the recurrence relation to find a closed-form formula for B(n) and compute B(n) for n=10 using the closed-form solution.

   b) Use the Akra-Bazzi formula to find Θ( ), asymptotic bounds for the following recurrence : T(n)=2T(n/2)+n, T(1)=1 **03**

2. a) Tulips are beautiful flowers that have been admired for centuries. They come in a wide variety of colors such as red, pink, yellow, white, orange, and purples. On an occasion, you need a bouquet of ten tulips. Now, how many ways can you choose a bouquet of tulips with the available colors? Use Bijection Rule. **03**

   b) A lottery pays you $10,000 per year for 15 years. The interest rate is 4%. What is the present value of your winnings? **03**

   c) The maximum overhang in the book staking problem is given by the following recurrence: **04**

$$B_1 = \frac{1}{2}$$

$$B_{n+1} = B_n + \frac{1}{2(n+1)}$$

Now convert this recurrence into sum problem and then find a closed form of the sum.

Or

Find a closed form for the following expression:

$$\sum_{i=0}^{n}\sum_{j=0}^{i}\sum_{k=0}^{j}\left(\frac{p}{q}\right)^{k}$$

3. a) Let G(x) is the generating function of the series 1, 2,3,4.....n,..... ,where G(x)=1/(x-1)^2. Now find the coefficient of this function using Maclaurin's Theorem. **03**

Or,

Write the generating function for the sequence 1,2,3,4 ..... and find the closed form using perturbation method.

b) Mr. X has certain conditions when he takes his pets outside: **05**

- **Rabbits**: He always brings an even number of rabbits, i.e., the number of rabbits can be 0, 2, 4, 6, etc.
- **Singing birds**: He brings a multiple of 5 singing birds, i.e., the number of birds can be 0, 5, 10, 15, etc.
- **Cats**: He can bring at most 1 cat, i.e., the number of cats can be 0 or 1.
- **Dogs**: He can bring at most 4 dogs, i.e., the number of dogs can be 0, 1, 2, 3, or 4.

Let d_n denote the number of ways Mr. X can bring exactly n pets. Find the solution of this counting problem using GF.

Or

You are preparing an ice cream sundae with n scoops of ice cream. You can choose from three flavors: chocolate, vanilla, and strawberry. There are constraints on how many scoops of each flavor you can use:

- The number of chocolate scoops must be odd.
- The number of vanilla scoops must be a multiple of 2.
- There can be at most 4 strawberry scoops.
- The total number of scoops in the sundae must be exactly n.

How many ways can you make a sundae with n scoops of ice cream that satisfies these conditions?

c) The factorial of n can be defined by the following product. Find a closed form of this product. **02**

$n! = \prod_{i=1}^{n} i$

International Islamic University Chittagong
Department of Computer Science and Engineering
Mid Term Examination Spring 2025
Course Code: CSE-4741 Course Title: Computer Graphics
Total Marks: 30 Time: 1:30 hours

Answer all questions. Figures in the right margin indicate full marks.

			Marks	CO	DL
1	a)	Define computer graphics. Write the application areas of computer graphics.	3	CO1	C1
	b)	If we use a 10-bit pixel values in a 24-bit lookup table representation, how many bytes does the lookup table occupy?	2	CO3	C3
	c)	What do you mean by subtractive color model? Give an example. Why an additional black pigment is used in printer?	3	CO2	C2
	d)	Write difference between of object space and image space.	2	CO2	C2
		OR Write down the differences between Raster display and vector display.			
2	a)	Solve the following equations for Bresenham's circle algorithm. $d_{i+1} = \begin{cases} d_i + 4x_i + 6 & if\ d_i < 0 \\ d_i + 4(x_i - y_i) + 10 & if\ d_i \geq 0 \end{cases}$	4	CO3	C4
		OR Suppose a circle has radius as 10 and centre of circle (100, 100). Indicate which raster location would be chosen while scan converting this circle using Bresenham's circle algorithm.			
	b)	What are the aliasing effects? Describe. How can we solve these problems?	3	CO2	C1
	c)	Write the flood-fill and boundary fill algorithm. Differentiate them also.	3	CO2	C2
3	a)	Find the new coordinates of the triangle P(2,2), Q(2,4), R(0,1) about Q(2,4) (i) it has been expanded twice in x direction and thrice in y direction (ii) reduced to half its size.	4	CO3	C4
	b)	"Instance transformation is the combination of many transformations" - Explain with necessary figures/examples.	2	CO1	C2
	c)	Find the transformation matrix that represents the rotation of a point (7,2) by 60° about the origin and about the point (3,3). What are the new coordinates after rotation?	4	CO3	C4
		OR Find the steps of transformation matrix M_L of mirror reflection of a point about a line L (y = 2+b).			

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in Computer Science and Engineering

Mid Term Examination, Spring 2025

Course Title: Machine Learning and Data Mining — Course Code: CSE-4877

Full Marks: 30 — Time: 90 Minutes

[Answer the following questions]

1. a) What is data mining? In your answer, address the following: 5 CO1

i. Is it a simple transformation or application of technology developed from databases, statistics, machine learning, and pattern recognition?

ii. Describe the steps involved in data mining when viewed as a process of knowledge discovery.

1. b) Define each of the following data mining functionalities: characterization, discrimination, association and correlation analysis, classification, regression, clustering, and outlier analysis. Give examples of each data mining functionality, using a real-life database that you are familiar with. 5 CO1

2. a) Suppose that the data for analysis includes the attribute age. The age values for the data tuples are (in increasing order) 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70. 5 CO2

i. What is the mean of the data? **ii.** What is the median? **iii.** What is the mode of the data? **iv.** Comment on the data's modality (i.e., bimodal, trimodal, etc.). **v.** What is the midrange of the data?

2. b) Suppose that a hospital tested the age and body fat data for 18 randomly selected adults with the following results: 5 CO2

age	23	23	27	27	39	41	47	49	50
%fat	9.5	26.5	7.8	17.8	31.4	25.9	27.4	27.2	31.2
age	52	54	54	56	57	58	58	60	61
%fat	34.6	42.5	28.8	33.4	30.2	34.1	32.9	41.2	35.7

i. Draw the boxplots for age and %fat. **ii.** Draw a scatter plot and a q-q plot based on these two variables.

OR

2. b) What is the best distance (or similarity) measure for each of the following applications? Give example for each case. 5 CO2

i. Calculate driving distance between two locations in your city. **ii.** Compare similar diseases with a set of medical test results as positive or negative; **iii.** Find similar web documents to a keyword query.

3. a) Suppose that the data for analysis includes the attribute age. The age values for the data tuples are (in increasing order) 13, 15, 16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 70. 5 CO2

Answer the following:

i. Use min-max normalization to transform the value 35 for age onto the range [0.0, 1.0]. **ii.** Use z-score normalization to transform the value 35 for age, where the standard deviation of age is 12.94 years. **iii.** Use normalization by decimal scaling to transform the value 35 for age. **iv.** Comment on which method you would prefer to use for the given data, giving reasons as to why.

3. b) What is data preprocessing? Take a look at the following dataset (Table 1).What kind of pre-processing it may require to make it suitable for applying necessary prediction algorithms? List the points. Can you redraw the dataset after applying the pre-processing techniques? Note that, the preprocessing steps should include the outlier detection also. 5 CO2

Gender	Age	Income level
Male	40	Low
Male	31	Medium
Female	41	Medium
Female	40	Low
Male	-13	Medium
Male	?	Medium
Female	35	---
Female	37	Medium
Female	41	High
Male	42	Medium
Female	71	High
Female	41	High
Male	40	N/A
Male	75	Low

Table 1

TID	List of items_IDs
T10	I1,I2,I5
T15	I2, I4
T20	I2,I3
T25	I1,I2,I4
T30	I1,I3
T35	I2,I3
T40	I1,I5
T45	I1,I2,I3, I5
T50	I1,I2,I3

Table2

OR

3. b) Consider the transactions in Table2 for a shopping mall. i. Apply the Apriori Algorithm to find the frequent itemset (minimum support=2) ii. Generate association rules (Minimum confidence threshold is 70%). (Note: show the steps according to algorithms)

Bismillahir Rahmanir Rahim

International Islamic University Chittagong

Department of Computer Science & Engineering

Mid Term Examination Spring 2025

CSE 4745 Numerical Methods

Total Marks: *30* Time: *90* Minutes

[Answer ***all*** the ***three*** questions. Figures in the right-hand margin indicate full marks.]

1.a)	Write short notes on: i) Inherent errors ii) Roundoff errors iii) Truncation errors	3	CO1 C1
b)	Describe the *banker's rounding rule* with examples. Use *banker's rounding rule* to round off the following numbers to four significant figures - **i) 405.5578 ii) 0.2342500 iii) 0.000098354 iv) 199.9999** *OR* How to count significant digits of a number? Use *banker's rounding rule* to round off the following numbers to four significant figures - **i) 405.6578 ii) 0.2341500 iii) 0.000098356 iv) 199.9399**	4	CO1 C2
c)	What do you mean by *absolute error* and *relative error*. Write down the approximate representation of **2/3** correct to *four significant figures* and then compute the absolute error and relative error.	3	CO1 C3
2.a)	What is *Horner's rule*? Evaluate the polynomial $f(x) = x^4 - 2x^3 + 5x^2 - 16x + 5$ using Horner's rule at $x = M$. [M means the *last digit* of your ID number]	2	CO1 C3
b)	Find the root of $f(x) = 2x^3 - 2x - 5 = 0$, correct to *two decimal places*, by using the *bisection method*. *OR* Find the root of the equation $f(x) = x^3 - 7x + 4$, correct to two decimal places, by using the *Newton Raphson method*. [*Newton-Raphson formula:* $X_{n+1} = x_n - f(x_n) / f'(x_n)$]	5	CO2 C3
c)	What is *synthetic division*? Find the *quotient polynomial* q(x) such that p(x) = (x - 5) q(x) where the polynomial $p(x) = x^3 - 6x^2 + 11x - 30 = 0$ has a root at $x = 5$.	3	CO2 C3
3.a)	What do you mean by *interpolation*? When *Newton's forward* and *Newton's backward* formulas will be used in interpolation and why?	2	CO3 C2
b)	Derive the *Newton's forward interpolation formula*. *OR* Derive the *Newton's divided difference formula*	3	CO3 C2
c)	The following table gives the sales of a software firm for the six years. **Year 2008 2012 2016 2020 2022 2024** **Sales 40 43 48 52 58 63** (in millions) Estimate the sales for the year **2023** [if the *last digit* of your ID is **odd**] / **2010** [if the *last digit* of your ID is **even**] using a *suitable interpolation formula*.	5	CO4 C3