

**Sylhet Engineering College, Sylhet**  
(Shahjalal University of Science & Technology)  
**Department of Computer Science and Engineering**  
3<sup>rd</sup> Year 1<sup>st</sup> Semester Final Examination – 2024

Course No: CSE-503

Course Title: Numerical Methods

Time: 03 (Three) hours

Full Marks: 60

N.B. : (i) Answer any three question from each PART  
(iii) Marks allotted are indicated in the margin

(ii) Use separate answer scripts for each PART  
(iv) Special Instruction (if any)-----N/A-----

**PART-A**

(Answer any three questions)

1. (a) Find the first approximate root of the equation  $x^3 - 2x^2 - 4 = 0$  by using bisection method. 02  
(b) Solve the following system of linear equations using Cholesky's factorization method: 08  

$$2x - 6y + 8z = 24$$

$$5x + 4y - 3z = 2$$

$$3x + y + 2z = 16$$
2. (a) What is interpolation? 02  
(b) Use the Runge-Kutta method of order four with  $h = 0.2$  to obtain an approximation to estimate  $y(0.4)$  for the solution of  $\frac{dy}{dx} = x^2 + y^2$  and  $y(0) = 0$ . 08
3. (a) Apply Lagrange's interpolation formula to find a polynomial which passes through the points  $(0, -20)$ ,  $(1, -12)$ ,  $(3, -20)$  and  $(4, -24)$ . 05  
(b) Find a root of the equation  $x^6 - x - 1 = 0$  using the secant method approximations: 05  
 $x_0 = 2$  and  $x_1 = 1$ .
4. (a) State Weddle's Rule for numerical integration. Derive its formula from the general Newton-Cotes formula and discuss the conditions under which it gives accurate results. 04  
(b) Using the Trapezoidal Rule, evaluate 06

$$\int_0^1 \frac{1}{1+x^2} dx$$

by dividing the interval into 5 equal parts. Compare the numerical result with the exact value of  $\tan^{-1}(1) = \frac{\pi}{4}$

**PART-B**

(Answer any three questions)

5. (a) What is the difference between absolute error and relative error? 02  
(b) When is numerical integration used? 02  
(c) Estimate the value of  $\sin\theta$  at  $\theta = 25^\circ$  using the Newton-Gregory forward difference formula with the help of the following table: 06

$\theta$	10	20	30	40	50
$\sin\theta$	0.1736	0.3420	0.5000	0.6428	0.7660

6. (a) Find a root of the equation  $3x - \cos x - 1 = 0$  using False position method given that the root lies between 0 and 1. 05  
(b) Use Euler's method to compute  $y(0.9)$  from the following differential equation: 05  
 $\frac{dy}{dx} = x^2$ ,  $y(0) = 1$  and  $h = 0.3$
7. (a) Using the Gauss elimination iteration method, solve - 08  

$$x + y + z = 1$$

$$4x + 3y - z = 6$$

$$3x + 5y + 3z = 4$$
- (b) What are the limitations of the naïve Gauss elimination method? 02
8. (a) Use Picard's method to solve  $\frac{dy}{dx} = x + y^2$ ,  $y(0) = 1$  up to 3<sup>rd</sup> approximation. 05  
(b) Fit an equation of the form  $y = ab^x$  to the following data: 05

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.6

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**3<sup>rd</sup> Year 1<sup>st</sup> Semester Final Examination – 2024**

**Course No: CSE-511**

**Course Title: Communication-I**

**Time: 03 (Three) hours**

**Full Marks: 60**

N.B. : (i) Answer any three question from each PART  
(iii) Marks allotted are indicated in the margin

(ii) Use separate answer scripts for each PART  
(iv) Special Instruction (if any)-----N/A-----

**PART-A**

(Answer any three questions)

1. (a) What is data communication? What are the basic characteristics of an effective data communication system? 05
- (b) Explain Pulse code Modulation technique with necessary diagram. 05
2. (a) Why is self-synchronization important in data transmission? 02
- (b) Draw the digital signals for the data stream 10110001 using Unipolar, NRZ-L, AMI, and Differential Manchester encoding schemes 04
- (c) Consider the bit sequence 11010000000010 and assume that the last non-zero signal level before transmission was negative. Draw the digital signal using B8ZS and HDB3 encoding schemes. 04
3. (a) Find the minimum Hamming Distance of the words: 00100, 10001, 10110, 01010 02  
How many errors can be detected in this scenario?
- (b) 'A simple parity-check decoder can detect an odd number of errors'. Justify the statement with a suitable example. 03
- (c) Consider the five numbers: 6, 5, 7, 15, 4. 05  
i) Apply Checksum technique and show the calculations at both the sender and receiver sides.  
ii) Explain with an example how it is possible that errors are not detected when several data words are altered in such a way that the sum and the checksum remain the same.
4. (a) Distinguish between a low-pass channel and a band-pass channel. 02
- (b) i) What is attenuation? How can we overcome it? 04  
ii) A signal travels from point A to point B. At point A, the signal power is 100 W. At point B, the power is 90 W. What is the attenuation in decibels?
- (c) i) We need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need? 04  
ii) A non-periodic composite signal contains frequencies from 10 KHz to 30 KHz. The peak amplitude is 10V at the lowest and the highest frequencies and 30V at 20 KHz. Assuming that the amplitudes change gradually from the minimum to the maximum, draw the frequency spectrum of the signal.

**PART-B**

(Answer any three questions)

5. (a) Define Frequency Division Multiplexing. Explain how FDM combines multiple signals into one. 06
- (b) Discuss serial and parallel transmission with advantages and disadvantages. 04
6. (a) Define Carrier signal and Modulation in analog transmission. 02
- (b) A communication system sends 3 bits at a time with a bit rate of 3 Mbps over a carrier of 10 MHz. Calculate the number of signal levels, the baud rate, and the bandwidth required for transmission. 03
- (c) Explain ASK and FSK with appropriate figures. 05
7. (a) Define bit rate and bit interval. A digital signal has a bit rate of 400 bps. Calculate the bit interval. 03
- (b) Define composite signal. How can a composite signal be decomposed into its individual frequencies? 03
- (c) Explain the working principle of optical fiber and mention two advantages and one limitation of using it as a transmission medium. 04
8. (a) The data rate of 3 input connections is 1 kbps (for each one). If 1 bit at a time is multiplexed, what is the duration of  
(i) each input slot, (ii) each output slot, and (iii) each frame? 03
- (b) Explain Multiple Slot Allocation, and Pulse Stuffing with suitable examples. 03
- (c) Explain why flow control and error control are important in the data link layer. Also, mention two ways to handle situations when the receiver cannot process incoming frames fast enough. 04

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**Final Examination, 2024**

**Course No: CSE 507**

**Time: 03(Three) hours**

**N.B.:** (i) Answer any three questions from each PART  
(iii) Marks allotted are indicated in the margin

**3<sup>rd</sup> Year 1<sup>st</sup> Semester**

**Course Title: Computer Networks**

**Full Marks: 60**

(ii) Use separate answer scripts for each PART

(iv) Special Instruction (if any) -----N/A-----

**PART-A**

(Answer any three questions)

1. (a) Define a computer network. Mention any three applications of computer networks. 03  
(b) Compare and contrast the OSI reference model and TCP/IP model in terms of layer structure, functionality, and protocol examples. 05  
(b) What is ARPANET? Why is it significant in networking history? 02
2. (a) What is the key difference between Pure ALOHA and Slotted ALOHA? 02  
(b) Explain in detail the working principle of CSMA/CD. Describe how it detects and handles collisions. 05  
(c) Differentiate between collision and collision-free protocols with suitable examples. 03
3. (a) What is the difference between circuit switched network and packet switched network? 03  
(b) What is the difference between unicast, broadcast and multicast? 03  
(c) Consider the data unit to be transmitted is- 10011001111000100010010010000100. Consider 8 bit checksum is used. Find out the error using checksum error detection method. 04
4. (a) Which layer of the OSI model typically handles flow control? What problem occurs if there is no flow control between sender and receiver? 1+2  
(b) Describe how Stop and Wait ARQ ensures reliable delivery over a noisy channel. 03  
(c) Illustrate the working of Go-Back-N ARQ when the acknowledgment is lost. 02  
(d) What is the main improvement of Selective Repeat ARQ over Go-Back-N? 02

**PART-B**

(Answer any three questions)

5. (a) Describe Physical and logical addressing with figure. 03  
(b) What do you mean about VLSM? Write down the benefits of it? 04  
(c) Determine the class of the following IPs: 03  
    i)15.0.4.1                      ii)128.60.4.10              iii)192.4.20.5  
    iv)224.10.1.1                  v) 250.0.0.1
6. Your organization has been assigned the network 192.168.20.0/24. You must create 6 fixed-size subnets, each with at least 25 usable host addresses.  
(a) Determine the subnet mask required to create the fixed subnets. 02  
(b) Calculate the number of subnets produced with your chosen mask. 01  
(c) Write the subnet address, first usable IP, last usable IP, and broadcast address for the 4<sup>th</sup> and 5<sup>th</sup> subnets. 04  
(d) If the company later needs 10 fixed-size subnets, state whether the same mask can be used. If not, determine the new subnet mask and justify your answer. 03
7. (a) What is the default port number used by SMTP? 02  
(b) A web application works on http:// but fails on https://. Discuss what SSL/TLS-related issues might be present and how to fix them. 04  
(c) You are asked to upload a file to a remote server. Which Internet service would you use, and what command would initiate the transfer? 04
8. (a) Compare the following devices in a tabular form: hub, switch, router 03  
(b) Explain how a gateway enables communication between networks using different protocols. 04  
(c) How can transmission media affect network performance and reliability? Discuss with examples. 03

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**Sylhet Engineering College, Sylhet**  
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**Department of Computer Science & Engineering**

**Final Examination, 2024**

**Course No: LAW 501**

**Time: 02 (Two) hours**

**3<sup>rd</sup> Year 1<sup>st</sup> Semester**

**Course Title: Cyber and Intellectual Property Law**

**Full Marks: 40**

N.B: (i) Answer any three questions from each PART  
(iii) Marks allotted are indicated in the margin

(ii) Use separate answer scripts for each PART  
(iv) Special Instruction (if any)-----N/A-----

**PART-A**

*(Answer any two questions)*

1. (a) What are the various actions taken by law enforcement agencies to combat cybercrimes, and how effective are these measures? 05
- (b) Discuss the origin and Development of Cyber Law and the Internet. 05
2. (a) How do cyber-crimes differ from terrestrial crimes? 02
- (b) Describe the concept of Cyber Jurisprudence and how the ICT Act 2006 addresses cybercrimes in Bangladesh. 04
- (c) Suppose two students from Sylhet Engineering College have been accused of committing cybercrimes. The first student made unauthorized modifications in the computer system of the admission database and copied information. The second student published fake and defamatory information on social media against his classmates. What punishments can each of them face under the law? Give your opinion? 04
3. (a) What are the advantages of an E-Journal? 02
- (b) Explain the types of E-governance. 03
- (c) What do you understand by the term E-readiness? Compare the E-readiness score of Bangladesh with that of other countries. 05

**PART-B**

*(Answer any two questions)*

4. (a) Evaluate the advantages and disadvantages of e-learning platforms in Bangladesh. How does it impact the education system? 05
- (b) How does the World Intellectual Property Organization (WIPO) contribute to the protection of IP rights worldwide? 05
5. (a) What is IP in Cyber Security Law? What are the rules and functions of WIPO? 03
- (b) Discuss the UNCITRAL Model Law on Electronic Commerce 03
- (c) Author Rina Das published her literary novel "Echoes of the River" in 2012 and passed away in 2024. Around the same time, two playwrights, Rafiq Ahmed and Sumaiya Karim, jointly created and published their drama "The Last Horizon" in 2010. Rafiq Ahmed died in 2030, while Sumaiya Karim passed away in 2035.  
➤ Based on the copyright rules for literary and joint works, determine the year in which the copyright for each of these works will expire and explain how you arrived at your answers. 04
6. (a) What is copyright? Discuss trademarks in cyberspace? 02
- (b) Distinguish Patent, Copyright & Trademark in Terms of Software Program. 03
- (c) A Bangladeshi startup invents a new eco-friendly battery design and a unique logo for its brand. As their legal advisor, explain which types of intellectual property protection they should apply for and why each is important. Discuss the relevant laws applicable in Bangladesh. 05

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 Department of Computer Science & Engineering

Final Examination, 2024

Course No: CSE 501

Time: 03 (Three) hours

3<sup>rd</sup> Year 1<sup>st</sup> Semester

Course Title: Database Management System

Full Marks: 60

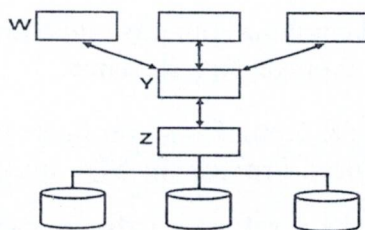
N.B. : (i) Answer any three questions from each PART  
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 (iv) Special Instruction (if any)-----N/A-----

**PART-A**

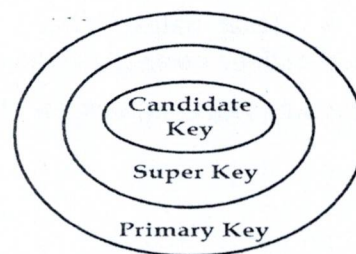
(Answer any three questions)

1. (a) Explain **six major problems** of the *Traditional File-Based System Approach* compared to the *Database System Approach*. 03
- (b) Explain the following diagram by describing **W, Y, and Z** in terms of **database abstraction**. 03



- (c) Construct a B+-tree for the following set of key values: (2, 31, 3, 7, 5, 19, 23, 29, 11, 17, 37, 8, 39, 15) using  $n=4$ . 04

2. (a) Analyze the given diagram in terms of the concept of **keys** in a database. 03  
 If the diagram is incorrect, **redraw it correctly** and explain your reasoning.



- (b) Complete the given table and explain the final results. 03

	Shared	Exclusive
Shared	?	?
Exclusive	?	?

- (c) Explain the **Referential Integrity Constraint** and describe its **two main types**. 04  
 Using an example table, explain the following three actions:  
 i) **ON DELETE CASCADE**  
 ii) **ON DELETE SET NULL**  
 iii) **ON DELETE NO ACTION**

3. (a) Write the properties of DDL and DML. Write Short notes of the following terms: 2+2  
**Instances, and Schemas, Entity Relationship Model**

- (b) Write appropriate **SQL queries to create the given tables**. 03

ID	Name	Address	Age
1	CR7	Dhaka	40
2	Mbappe	Sylhet	22
3	Vini	Jamalpur	24

Table: Players

ID	Phone
1	xx
2	yy
1	zz
3	pp
3	ss
2	tt

Table: Contact

- (c) Consider the following relation 03

**R(MNZRQSTVWXY)**

With the following functional dependencies:

$M \rightarrow N$

$Z \rightarrow RQ$

$MN \rightarrow S$

$T \rightarrow VW$

$S \rightarrow X$

$M \rightarrow Y$

Determine whether the relation R is in 3NF or not

If not in 3NF, decompose the relation that satisfy 3NF showing each step

4. **Database Schema** 3
- Table 1: Products** +2
- (ProdID, CategoryID, CategoryName, Price, Discount) +3
- Primary Key: ProdID +2
- Table 2: Sales**
- (SaleID, ProdID, Quantity, SaleDate)
- Primary Key: SaleID
- Foreign Key: ProdID references Products(ProdID)
- (a) A Sales Manager wants to analyze the **net revenue** distribution across product categories, where **Net Revenue = Price – Discount**
- Prepare a report that:
- i. Lists all categories where the **average Net Revenue** of products is **greater than TK 50,000**.
  - ii. Lists all categories where the **average Net Revenue** of products is **less than TK 20,000**.
- The final output should combine both sets into a single result containing the columns: CategoryName and Average\_Net\_Revenue.
- (b) Increase the **discount** by TK 1,000 for all products whose **price** is less than the **average price** of all products. Provide the SQL query for this update.
- (c) Prepare a report showing the **total sales value per category**, where **Total Sales Value = (Price – Discount) × Quantity**
- The report must include:
- CategoryName
  - Total\_Sales\_Value
- Only include categories whose **total sales value** exceeds **TK 200,000**.
- (d) EXPLAIN THE CONCEPT OF 3 TYPES OF ANOMALIES IN TERMS OF NORMALIZATION.

**PART-B**

(Answer any three questions)

5. (a) Analyze the following statement with an example: 03  
 “Any attribute that is not present in the GROUP BY clause must appear only inside an aggregate function if it appears in the SELECT clause; otherwise, the query is treated as erroneous.”
- (b) Explain the **two classifications for deadlock prevention** based on **timestamps**. 03
- (c) Describe the **steps for deadlock detection and recovery** in detail. 04
6. (a) Consider a **parallel execution** of transactions (T1, T2, T3, T4, T5). 04  
 Analyze whether it is possible to obtain an **equivalent serial schedule**.  
 Provide the **precedence graph** and explain each step clearly.

T1	T2	T3	T4	T5
R(A)				
	W(A)			
W(B)				
		W(B)		
	R(C)			
		W(C)		
	W(A)			
			R(A)	
W(D)				
				R(D)
				W(E)
			W(E)	
			W(A)	
		R(A)		
W(E)				
				R(E)
				R(E)
W(E)				

- (b) Assume the initial values:  
 $A = 1000, D = 2000.$

Analyze the **Lost Update Problem** according to the following **parallel execution of transactions,**

showing each intermediate state of **database storage** and **RAM storage.**

T1	T2
Read(A)	
$A = A - 50$	
	Read(A)
	$T = A * 0.1$
	$A = A - t$
	Write(A)
	Read(D)
Write(A)	
Read(D)	
$D = D + 50$	
Write(D)	
Commit	
	$D = D + t$
	Write(D)
	Commit

Time

- (c) **“Natural Join operation is more time and space efficient than the Cartesian Product operation.”**

Analyze this statement as **true or false** with a proper example and calculations.

7. (a) A disk manufacturing company produces disks with:  
 $MTTF = 1000$  hours ( $\approx 41$  days), and  $MTTR = 10$  hours.

i) Explain the **concept of RAID (Redundant Array of Independent Disks).**

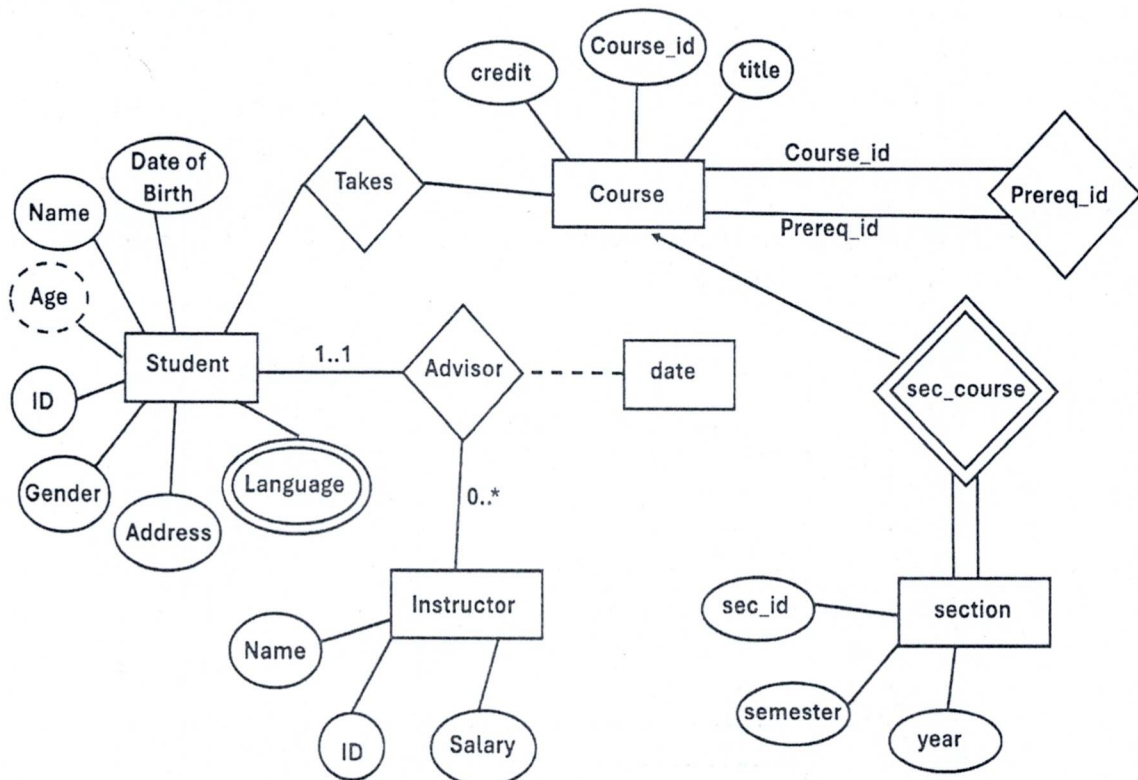
ii) Analyze the following statement:

“Using two disks for your database instead of one can extend the reliability of the system exponentially.”

Show calculations of **Mean Time to Data Loss (MTTDL)** for one disk and for two disks.

- (b) Discuss about ACID properties of Transaction.

8. (a) Explain all the **notations and symbols** used in the given **ER-Diagram**, including their meaning and purpose.



- (b) Explain the concepts of:

- **Weak Entity Set**
- **Partial Key**
- **Discriminator Attribute**

Provide suitable examples for each.