International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE, Semester Final Examination, Autumn 2022

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

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

Course Outcomes (COs) of the Questions	
CO1	Understand and analyze the architectures of different types of computer complex networks and protocols
CO2	Evaluate the performance of protocols and networks
CO3	Demonstrate a familiarity with major network and security algorithms and protocols
CO4	Identify and apply applications of computer networks with determining suitable alternatives of the networks for the alternative conditions.

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

Part A
[Answer the questions from the followings]

1.	a)	Apply the LSR algorithm to the network shown in Figure 1 in order to construct a routing table for router 'A'.	CO2	Ap	5

Fig-1

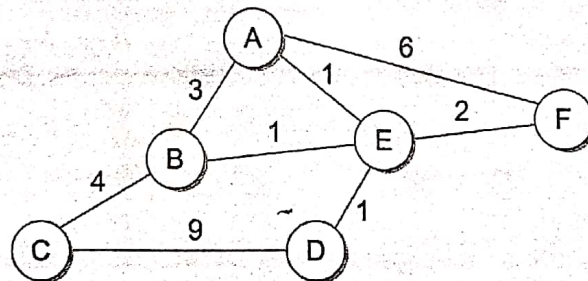|					
1.	b)	Apply the DVR algorithm to the network shown in Figure 1 in order to construct a routing table for router 'A'	CO2	Ap	5
2.	a)	Explain how Random Early Detection tackles congestion.	CO4	U	5
2.	b)	What do you mean by QoS? Describe how the different applications are related with the various network properties.	CO2	An	5

OR

2	a)	Write down the difference between BGP and OSPF routing protocols.	CO2	Ev	4
	b)	Write short notes on Broadcast, Anycast and Multicast routing.	CO1	U	6

Part B
[Answer the questions from the followings]

3.	a)	What is the necessity of transport layer? How does transport layer achieve the reliability?	CO2	An	5
3.	b)	Discuss on crash recovery strategies of the transport layer.	CO2	An	5
4.	a)	TCP is the main protocol of transport layer, then why UDP exists?	CO4	Un	5
4.	b)	What is the silly window syndrome? How to avoid silly window syndrome?	CO4	Un	5

OR

4.	a)	Computer A has 100 MB data to send on a network and transmits the data in a burst at the rate of 20 Mbps. The maximum transmission rate across routers in the network is 10 Mbps. If Computer A's transmission is shaped using a leaky bucket with sufficiently large size then how much time it will take to send into the network.	CO4	Un	5
4.	b)	Explain TCP connection establishment and connection release.	CO4	U	5
5.	a)	Suppose you make a DNS query for ai.cse.iiuc.ac.bd, write down the steps of resolving this query.	CO5	App	5
5.	b)	How does the email architecture differs from the web architecture?	CO3	Un	5

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE

Final Exam, Autumn 2022

Course Code: **CSE 4743** Course Title: **Computer Security**

Time: 2 hours 30 minutes Full Marks: 50

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

(ii) <u>Course Outcomes</u> and <u>Bloom's Levels</u> are mentioned in additional Columns

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Part A Marks

[Answer the questions from the followings]

1. a) Write the purpose of encryption with private key and encryption with public key in Public key cryptosystems. **OR** Explain symmetric secret key distribution between two parties ensuring confidentiality and authentication.	CO1 U	5
b) Draw a block diagram and briefly explain the working steps of Intrusion Prevention Systems (IDS). Compare the benefits and drawbacks of IPS with IDS.	CO2 App	5
2. a) Explain the process given in figure:	CO1 U	5

(a)

$E(K, [M \| H(M)])$

$H(M)$
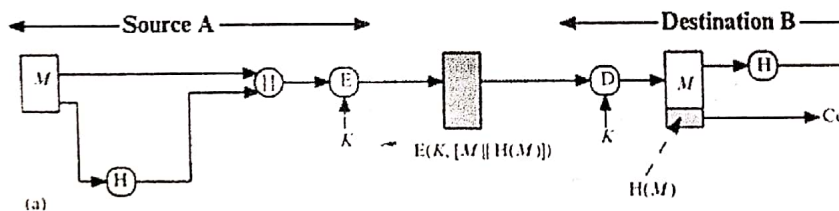
b) In the Kerberos authentication shown below, why are ID_c, AD_c and ID_v included included in the encrypted ticket, why ticket is encrypted with K_v?	CO2 App	5

> **(1)** C → AS: $ID_C \| P_C \| ID_V$
> **(2)** AS → C: Ticket
> **(3)** C → V: $ID_C \| Ticket$
> $Ticket = E(K_v, [ID_C \| AD_C \| ID_V])$

OR

b) Design a Hash function that uses the XOR operation of inputs to get the bits of the output hash. Does such a hash function fulfill the Pseudorandmoness requirement?	CO2 App	5

Part B
[Answer the questions from the followings]

3.	a)	Explain the social engineering attack cycle. List the organizational and technical defense mechanisms against social engineering attacks.	CO3	R	4
	b)	What are the desired attributes of a cryptographic hash function? Use examples if required.	CO2	U	3
	c)	Explain how non-repudiation is ensured by using a digital signature.	CO2	App	3
4.	a)	Explain the steps of the Kerberos authentication protocol with necessry figures.	CO1	E	5
	b)	What is a digital signature? Why it is used? If a person **P** signs message **M** with signature **S(P, M)**, what are the desired properties from the security perspective?	CO1	R	5
5.	a)	Discuss some intrusion detection methods.	CO4	U	4
	b)	Show with example and explain why it is extremely difficult to insert a fake block of transaction into a block chain.	CO3	An	6

QR

5.	a)	Demonstrate some packet filtering policies that are configured in your firewall.	CO4	App	4
	b)	Explain Proof of work in Blockchain. Why is it an expensive process? What is the benefit of having such a process in Blockchain.	CO3	U	6

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE Final Term Examination, Autumn 2022

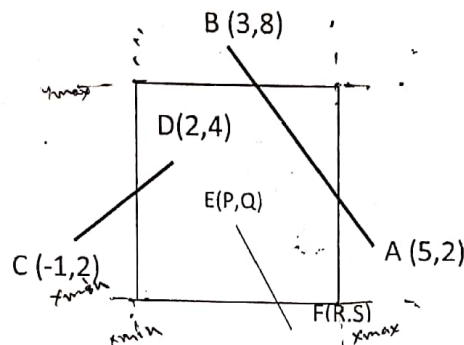Course Code: CSE 4741   Course Title: Computer Graphics
Total marks: 50   Time: *2 hours 30 minutes*
[Answer all the questions; Separate answer scripts must be used for Group A and Group B]

GROUP A

i. a) What is viewing transformation? Find the general transformation matrix for window-to-viewport mapping.   **4**

b)   **4**

Find the region codes for end point A(5,2); B(3,8); C(-1,2), D(2,4) and E(P,Q) & F(R,S). Then, Clip the line segments AB, CD and EF using Cohen-Shuterland algorithm. *(Assume $X_{min}=-1$, $X_{max}=5$, $Y_{min}=-1$, $Y_{max}=5$),(Assume the values of P,Q,R,S from your ID: CXXPQRS)*

OR

Find the region codes for end point A(5,2); B(3,8); C(-1,2), D(2,4) and E(P,Q) & F(R,S). Then, Clip the line segments AB, CD and EF using Liang-Bursky algorithm. *(Assume $X_{min}=-1$, $X_{max}=5$, $Y_{min}=-1$, $Y_{max}=5$),(Assume the values of P,Q,R,S from your ID: CXXPQRS)*

c) Define convex and concave polygon. How to determine the location of a point against a positively oriented line segment?   **2**

2. a) Given a 3D object with coordinate points A(0, 3, 3), B(3, 3, 6), C(3, 0, 1), D(0, 0, 0). Apply the scaling parameter 2 towards X axis, 3 towards Y axis and 3 towards Z axis and obtain the new coordinates of the object.   **4**

OR

Define tilting as a rotation about the x axis is 30° followed by a rotation about the y axis is 45°. a) Find out the rotation matrix b) does the order of performing the rotation matter?

b) What is the difference between geometric transformation and coordinate transformation?   **2**

OR

Given a 3D unit cube. Find the mirror reflection of the object about zx plane.

c) Given a 3D triangle with coordinate points A(3, 4, 1), B(6, 4, 2), C(5, 6, 3). Apply the reflection on the XY plane and find out the new coordinates of the object. **4**

GROUP B

3. a) What is the difference between orthographic and oblique projection. Describe some subcategories of these two projections. **4**

   b) The unit cube is projected onto the xy plane. Draw the projected image using the standard perspective transformation with **4**

      (i) s = 4

      (ii) s = 15

      a) where s is distance from the view plane.

   c) Draw isometric and diametric projection of the unit cube into the xy plane. **2**

OR

Show A 3D Graphics Pipeline with proper diagram.

4.a) What is the difference between polygon and polyhedron. **2**

   b) Describe the different ways of representing a polygonal net model. **3**

   c) Describe subdivision algorithm for hidden surface removal. **5**

Or

Describe Z-buffer algorithm for hidden surface removal.

5.

a) "Phong model is widely used to mimic the reflection of light from object surfaces to the viewer's eye". Describe the Phong model in brief. **4**

b) Describe a recursive ray tracing method. How ray tracing algorithms help to represent realistic pictures? **3**

Or

What is light? What are the basic characteristics of light? Describe the visible band of electromagnetic spectrum.

c) A ray is represented by r(t)=I+J-2K and d=2I+3K. Find the coordinates of the points on the ray that corresponds to t=0,1 and 2 respectively. **3**

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International Islamic University Chittagong
Department of Computer Science & Engineering
B. Sc. In CSE Semester Final Examination, Autumn 2022

Course Code: CSE 4745   Course Title: **Numerical Methods**
Total Marks: *50*   Time: 2 Hours 30 Minutes

[Answer *all* the questions. Figures in the right hand margin indicate full marks.
Separate answer script must be used for Group A and Group B]

Group A

1.a) Describe the **Matrix inversion method** to solve the system of linear equations.   5

OR

Describe the *Cramer's rule* to solve the system of linear equations.

b) A company produces four different products. They are processed through four different types of   5
departments **D1, D2, D3** and **D4**. The table below gives the number of hours that each department
spends on each product.

Department	Products			
	P1	**P2**	**P3**	**P4**
D1	2	3	1	2
D2	1	2	2	4
D3	3	4	4	5
D4	3	2	2	3

Total production hours available each month in each department is as follows:

Department	D1	D2	D3	D4
Hours	265	260	312	250

Formulate the appropriate system of linear equations to deteremine the quantities of the four
products that can be produced in each month, so that all the hours available in all departments are
fully utilised. Determine how much **time** each department spends for each product using **Jacobi's
method / Gauss-Seidel method.**

2. a) **How can you say that a system is diagonally dominant ?Give your answer with proper**   2
example

b). **Derive an equation to fit a parabola.**   3

c) Number of man-hours and the corresponding productivity (in units) are furnished below. Fit a   5
simple linear regression equation $Y = a + bx$ applying the method of least squares.

Man hours	3.6	4.8	7.2	6.9	10.7	6.1	7.9	9.5	5.4
Productivity in unit	9.3	10.2	11.5	12	18.6	13.2	10.8	22.7	12.7

OR

Fit the power function $y=ax^b$ to the data in the table below:

x	2	4	6	8
y	1.4	2.0	2.4	2.6

Group B

3.a) Determine the *first order* and *second order derivatives* using Newton's forward interpolation formula. **4**

 b) In a machine a slider moves along a fixed straight rod. Its distance **x** units along the rod is given below for various values of the time **t** seconds. **4**
 Find i) the *velocity* of the slider and ii) its *acceleration* when **t = 0.3 sec**

t (second)	0.0	0.1	0.2	0.3	0.4	0.5	0.6
x (unit)	3.013	3.162	3.207	3.364	3.395	3.381	3.324

 c) Explain how numerical differentiation can be used to find the *maximum* and *minimum* values of a tabulated function. **2**

4.a) When do we need to use a numerical method instead of analytical method for *integration*? **1**

 b) Derive the *Trapezoidal rule* for integration using Newton's forward difference formula. **4**

 c) Calculate the value $\int_0^1 \frac{1}{(1+x)}dx$ correct up to 3 significant figures taking six intervals by trapezoidal rule **5**

Or

Evaluate $\int_0^{0.6} e^{sinx} dx$ taking n = 6, correct to five significant figures by Simpson's one-third rule.

5.a) What do you mean by the *order* and the *degree* of a differential equation? How many *initial conditions* do we require to solve a 4th order differential equation? **2**

 b) Describe the *Taylor's series method* for the numerical solution of ordinary differential equation. **3**

 c) Use the fourth order Runge-kutta method to estimate y(0.2)of the following equation $\frac{dy}{dx} = x + y$ given that y(0)=1, when h=0.1 **5**

Or

Given $\frac{dy}{dx} = y - x$, where y(0) = 2, find y(0.1) and y(0.2) by Euler's method up to two decimal places.

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE Final Examination, Spring 2023
CSE-4747　　　　**Mathematical Analysis for Computer Science**
Time: 2 Hours 30 Minutes　　　　　　　　Total Marks: 50

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

Group A　　　　　　　　　　　　　　　　　　　　　　CO　DL

1.a. Farisha just graduated from high school. She was accepted to three reputable colleges.　CO3　N　5
- •With probability 4/12, she attends Yale.
- •With probability 5/12, she attends MIT.
- •With probability 3/12, she attends Little Hoop Community College.

Farisha is either happy or unhappy in college.
- •If she attends Yale, she is happy with probability 4/12.
- •If she attends MIT, she is happy with probability 7/12.
- • If she attends Little Hoop, she is happy with probability 11/12.

   I.　Draw the tree diagram. On the diagram, fill in the edge probabilities, and at each leaf write the probability of the corresponding outcome.
   II.　What is the probability that Farisha is happy in college?
   III.　What is the probability that Farisha attends Yale, given that she is happy in college

1.b. There is an unpleasant, degenerative disease called Beaver Fever which causes people to tell　CO3　N　5 math jokes unrelentingly in social settings, believing other people will think they're funny. Fortunately, Beaver Fever is rare, afflicting only about 1 in 1000 people. Doctor Islam has a fairly reliable diagnostic test to determine who is going to suffer from this disease:
- If a person will suffer from Beaver Fever, the probability that Dr. Islam diagnoses this is 0.99.
- If a person will not suffer from Beaver Fever, the probability that Dr. Islam diagnoses this is 0.97.

Let B be the event that a randomly chosen person will suffer Beaver Fever, and Y be the event that Dr. Islam's diagnosis is "Yes, this person will suffer from Beaver Fever," with B^c and Y^c being the complements of these events.
Now find $Pr[B]$, $Pr[Y|B]$, and $Pr[Y^c|B^c]$

2.a. Every minute a data center sees a single disk failure with probability p. Assume that more than　CO2　N　5 a single failure does not occur in a minute, and occurrences of failure are independent from minute to minute. What is the probability that there will be no disk failures in a given day? What is the probability that there will be no more than two disk failures in a given day? In addition, starting at an arbitrary point in time, what is the expected duration an observer has to wait before encountering the first disk failure?

OR

The probability that you manage to get ready on time at the start of a given day is 0.7 and when you are ready on time you can then take the university bus. Otherwise, you have to take a public/local bus to get to the campus. The university bus is equally likely to take 41, 42, ··, or 50 minutes to reach the campus, whereas the local/public bus is equally likely to take 46, 47, or 55 minutes (integral measures in both cases).
What is the expected time for you to get to the campus on any given day? What is the probability
that you'd manage to get to the campus within 45 minutes on any given day?

2.b. Let we flip a fair coin 5 times. X is a random number that represents the number of heads that　CO3　N　5 come up independently from the experiment. Now find out the probability distribution of the random variables using binomial distribution. Also, plot the probability distribution function.

OR

A fair 6-sided die is rolled twice. Consider the following three events A, B and C:
A ≡ 1st roll is 1, 2 or 3.
B ≡ 1st roll is 3, 4 or 5.
C ≡ the sum of the two rolls is 9.
Determine the sample space and the outcome probabilities.
Then express the three events on that basis before showing whether they are pairwise independent and/or mutually independent.

Group B

3.a. A local area network has its n nodes share a single wireless channel. Each of these nodes transmits its packet to the access point (AP) at any given time-slot with probability p (independent of the actions of the other nodes and occurrences in the prior slots). Whenever more than one node transmits in a particular slot, collision occurs and the AP cannot correctly receive any of the transmitted packets. When no nodes transmit during a particular slot, it goes idle.

Now answer the following.

    i. Find the probability that a particular node's transmission in a given slot will be successful.

    ii. Find the expected number of nodes that refrain from transmitting in a given slot.

    iii. Find the probability that two successive slots on the channel go idle.

CO3   N   5

3.b. If an aircraft is present in a certain area, a radar detects it and generates an alarm signal with probability 0.99. If an aircraft is not present, the radar generates (false) alarm, with probability 0.10. We assume that an aircraft is present with probability 0.04. What is the probability that an aircraft is indeed present, given that an alarm is generated?

OR

A lie detector is 90 percent effective in detecting a lie when the person is, in fact, lying. However, the detector also yields a "false positive" result for 1 percent of the truthful persons tested. (That is, if a person being tested is truthful, then, with probability 0.01, the test result will indicate that he is lying.) If 15 percent of the population actually lie, what is the probability that a person is indeed lying given that his test result indicates him to be lying?

CO3   N   5

4.a. The transition matrix for people voting for candidates from various political parties in an election year is given below. If a person votes for the candidate from one party in an election, that person may vote for the same party in the next election or may switch to vote for a candidate from another party in the next election. Democrats, Republicans, and Independents are denoted by the letters D, R, and I.

CO3   N   5

$$
\begin{array}{c}
\text{This} \\
\text{Election}
\end{array}
\begin{array}{c}
 \\
D \\
R \\
I
\end{array}
\begin{array}{c}
\text{Next Election} \\
\begin{array}{ccc}
D & R & I
\end{array} \\
\left[
\begin{array}{ccc}
.6 & .3 & .1 \\
.3 & .6 & .1 \\
.2 & .2 & .6
\end{array}
\right]
\end{array}
$$

Assume there is an election every year so that the transition period is 1 year.

    I. Find the probability that a person who votes Democratic in the current election will vote Republican in the next election.

    II. Find the probability that a person who votes Democratic in the current election will vote Republican in the election two years from now.

4.b. How can you measure the importance of pages (Page Rank) using Markov chain? When a Markob chain is ergodic?

CO2   C   5

OR

A Web graph is made of Webpages linking to each other via hyperlinks. Find a Markov chain based model that produces relative importance or ranks of the pages in a Web graph. Remark on the ways to handle edge cases such as isolated pages.

5.a. Derive the steady state probability of the M/M/1 queuing system.

CO3   N   3

5.b. On a network gateway, measurements show that the packets arrive at a mean rate of 125 packets per second (pps) and the gateway takes about two milliseconds to forward them. Using an M/M/1 model,

CO3   N   6

    I. Analyze the gateway (Gateway Utilization, Steady state probability Mean Number of packets in the gateway, Mean time spent in the gateway.

    II. What is the probability of buffer overflow if the gateway had only 12 buffers?

    III. How many buffers do we need to keep packet loss below one packet per million?

5.c. A monitor on a disk server showed that the average time to satisfy an I/O request was 100 milliseconds. The I/O rate was about 100 requests per second. What was the mean number of requests at the disk server?

CO3   N   1

International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE

Lab Final Exam, Autumn 2022

Course Code: **CSE 3634**

Time: 60 minutes

Course Title: **Computer Networks Lab**

Full Marks: 33

1.		When you configure static IP for a LAN, do you need to assign default gateway and DNS server address on the static IP configuration panel? Please explain.			5
2.		Explain the purpose of the field TTL when you ping a PC.			5
3.		Explain the fundamentals of static route configuration.			5
4.		For which device you need to assign static IP during DHCP configuration? Write down the steps of DHCP configuration for a network that has multiple LANs. (specific configuration commands not required).			5
5.		Write down the effects of following commands: ▸ *Switch#configure terminal* ▸ *Switch(config)#interface fastEthernet0/1* ▸ *Switch(config-if)#switchport mode access* ▸ *Switch(config-if)#switchport access vlan 1* When to use straight through and crossover cable?			5
6		What is VLAN trunk? Is the following an ethernet, IP or ICMP header? 0 4 8 14 19 PREAMBLE: 101010...1011 DEST MAC: 0050.0F01.B534 SRC MAC: 0001.63D6.2181 TYPE: 0x800 DATA (VARIABLE LENGTH) FCS: 0x0			5
7		You are allocated the IP address 192.168.100.0/24. Now if you want to keep 4 bits for subnets, what will be the subnet mask?			3

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE
Lab Final Exam, Autumn 2022

Course Code: **CSE 4744**　　　　　　　　　　　Course Title: **Computer Security Lab**

Time:　45 minutes　　　　　　　　　　　　　　Full Marks: 20

1　　What are the advantages of running Kali on a virtual machine?　　4

2　　"Port scanning is seen as an aggressive method"- explain　　4

3　　Write down whether the following statements are true or false:　　4

i. Hostname of target must be known to scan the target with nmap.

ii. The command *nmap {target}* informs you how many ports are closed.

4　　What does the following command achieve?　　4

i. *#sudo airmon-ng start wlan0*

ii. *# iwconfig*

5　　What is ARP? How to see ARP messages with Wireshark?　　4