University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Final Examination | **Fall-2023** | **3rd Year 1st Semester**

Course Code: CSE 305 | Course Title: System Analysis and Design | Credit: 3

Time: 3.00 Hour. | Full Mark: 50

There are Five Questions. Answer all of them. Part marks are shown in the margins.

1. a. List the steps to find the critical path of a project. [3] [CO1]

   b. Explain the purpose of using Class Diagram. [3] [CO1]

   c. Describe the major notations of Data Flow Diagram (DFD). [4] [CO1]

2. a. Product manager has planned a list of activities to develop a software product as mentioned in the following table. Determine the critical path and total project duration. [7] [CO2]

Activity	Duration (days)
1-2	4
1-3	1
2-4	1
3-4	1
3-5	6
4-9	5
5-6	4
5-7	8
6-8	1
7-8	2
8-10	5
9-10	7

   b. As an IT manager in a large international company, you introduce a new IT program with a budget of Taka 250,000. The result of this program is a Taka 200,000 growth in profits over each of the following two years. Note that your total profit from this investment is the profit from the first year plus the profit from the second year. Calculate Return on Investment (ROI). [3] [CO2]

3. a. Analyze with example the process of creating a Gantt Chart. [5] [CO3]

   b. Compare between Program Evaluation and Review Technique (PERT) and Gantt Chart. [5] [CO3]

4. Suddenly, X, Y, and Z have come to visit W's house. As they met after a long time, they wanted to enjoy their time together and decided to visit a historical place. Hence, they decided to go to the place by Uber. Uber is the most popular 'transport service providing app' in our country. To get service using the Uber app, customers need to register with their location, mobile number and email address. Uber app has to collect and store this user information. Uber provides the services through drivers and receives the payment from customers. As the driver was experienced, 'X' was satisfied with the services and gave him positive feedback. Design Uber's system using a Use Case Diagram. [10] [CO4]

5. a. After the dullness of Covid-19, Cox's Bazar became a new normal tourist destination with strict Covid-19 protocols. Two friends A and B decided to cut the boredom of the lockdown and go to Cox's Bazar as soon as the lockdown ended. Lucky for them, Hotel Cox at Cox's Bazar is offering buy 1 get 1 hotel room for the students. So 'A' decided to surprise 'B' with Hotel Cox reservation for them. To avail this opportunity, every student must have to register on their website. A's login information will be stored in the database. 'A' selected two rooms as of hotel's offer. After selecting everything, 'A' paid the total amount with his/her credit card. All of this information is stored in the database. Design a sequence diagram for the given scenario. [10] [CO4]

OR

5. a. A bank has three types of accounts: checking, savings, and loan. Following are the attributes for each type of account: [10] [CO4]

CHECKING: Acct_No, Date_Opened, Balance, Service_Charge

SAVINGS: Acct_No, Date_Opened, Balance, Interest_Rate

LOAN: Acct_No, Date_Opened, Balance, Interest_Rate, Payment

Assume that each bank account must be a member of exactly one of these subtypes. At the end of each month, the bank computes the balance in each account and mails a statement to the customer holding that account. The balance computation depends on the type of the account. For example, a checking account balance may reflect a service charge, whereas a savings account balance may include an interest amount. Draw a class diagram to represent the situation.

University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Final Examination | **Fall-2023** | **3rd year 1st Semester**

Course Code: CSE 303 Course Title: Data Communication | Credit: 3

Time: 3.00 Hour. | *Full Mark: 50*

There are **Five** Questions. Answer all of them. Part marks are shown in the margins.

1. a. According to the OSI model, the network layer is in charge of sending individual packets from the source host to the destination host, whereas the data link layer moves frames from one hop (node) to the next. Provide appropriate figures to support your discussion of these two phenomena (from digital data to signal conversation and vice versa). **[5] [CO1]**

   b. Explain the distinctions between Local Area Networks (LANs), Metropolitan Area Networks (MANs), and Wide Area Networks (WANs), focusing on their respective functionalities and applications. Provide real-world examples to illustrate the practical implications of these distinctions. **[5] [CO1]**

2. a. The 8B6T encoding scheme takes 8 bits of binary data and encodes them using 6 ternary signal elements. Recall that each ternary signal element can take on one of three values (positive, negative, and zero voltage). Table 1 is attached to this question (check the last page of this question paper) and is a portion of the 8B6T code table. Now, implement an 8B6T encoding scheme to solve the DC balancing issue in the binary sequence "00010001 01010011 01010000". Provide a detailed explanation of the encoding process, and draw a schematic diagram illustrating the encoding of the given binary sequence. **[5+2 =7] [CO2]**

   b. The data will be sent over a channel with a bandwidth of B = 3000 Hz at a rate of 10,000 bits per second. Establish the channel's necessary signal-to-noise ratio and the point at which the bandwidth was extended to 9000 Hz. **[3] [CO2]**

OR

   a. ISPs advertise Bandwidth to the customers, because that value is known, and it represents the best-case scenario. But their hype about "game-changing super **[5+2 =7] [CO2]**

speeds blazing into town" may be misleading- according to this statement explain the concepts of Channel Bandwidth, Attenuation, and Throughput. How does Signal-to-Noise Ratio (SNR) affect the quality of communication systems, and which is better for transmission?

b. A 5-bit DAC has a current output. For a digital input of 10100, an output current of 10mA is produced. What will I_{OUT} be for a digital input of 11101? [3] [CO2]

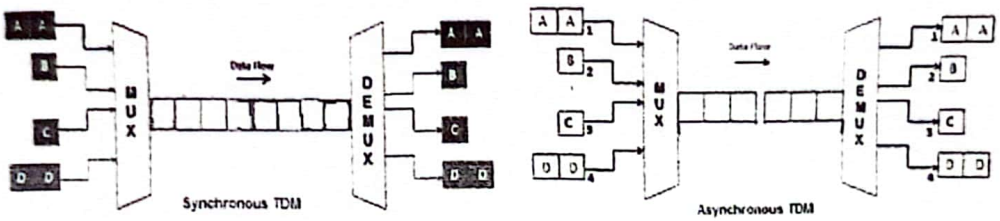
3. a. Consider a communication system that uses a Cyclic Redundancy Check (CRC) method to transmit a message 11001001 with the polynomial function x^3+1 to detect errors in data transmission. Use polynomial long division to determine the message that should be transmitted from the sender side. Next, corrupt the left-most third bit of the transmitted message and show that the error is detected by the receiver using the CRC technique. [4+3 =7] [CO3]

b. How do Dense Wavelength Division Multiplexing (DWDM) and Coarse Wavelength Division Multiplexing (CWDM) differ in terms of their principles, applications, and advantages, and what are the key factors influencing the choice between these two technologies in optical networking? 3 [CO4]

4. a. Host A wants to send 10 frames to host B. The hosts agreed to go with Selective Repeat ARQ. How many frames are transmitted by host A if every 6th frame that is transmitted by host A is either corrupted or lost? Also, compare the number of transmissions of SR ARQ with GO-Back-4 ARQ. [3+3 =6] [CO3]

b. Describe modulation's function and how it allows information to be transmitted over a variety of communication methods. Furthermore, contrast and analyze the distinctions among phase modulation (PM), frequency modulation (FM), and amplitude modulation (AM), giving instances of situations in which each modulation technique is most suitable. [4] [CO3]

5. a. [4] [CO4]



The above schematic diagram depicts two types of TDM transmission. According to the figure, **analyze** how data (e.g., AA, B, C, DD) will pass from sender to receiver frame by frame.

b. Construct the following digital signal diagram, if you want to send a data packet, 010101101 to your friend. Show the line coding schemes. Use examples where appropriate. [6] [CO4]

i. RZ
ii. Pseudoternary
iii. NRZ-L

Data	Code	Data	Code	Data	Code	Data	Code
00	-+00-+	20	-++-00	40	-00+0+	60	0++0-0
01	0-+-+0	21	+00+--	41	0-00++	61	+0+-00
02	0-+0-+	22	-+0-++	42	0-0+0+	62	+0+0-0
03	0-++0-	23	+-0-++	43	0-0++0	63	+0+00-
04	-+0+0-	24	+-0+00	44	-00++0	64	0++00-
05	+0--+0	25	-+0+00	45	00-0++	65	++0-00
06	+0-0-+	26	+00-00	46	00-+0+	66	++00-0
07	+0-+0-	27	-+++--	47	00-++0	67	++000-
08	-+00+-	28	0++-0-	48	00+000	68	0++-+-
09	0-++-0	29	+0+0--	49	++-000	69	+0++--
0A	0-+0+-	2A	+0+-0-	4A	+-+000	6A	+0+-+-
0B	0-+-0+	2B	+0+--0	4B	-++000	6B	+0+--+
0C	-+0-0+	2C	0++--0	4C	0+-000	6C	0++--+
0D	+0-+-0	2D	++00--	4D	+0-000	6D	++0+--
0E	+0-0+-	2E	++0-0-	4E	0-+000	6E	++0-+-
0F	+0--0+	2F	++0---0	4F	-0+000	6F	++0--+
10	0--+0+	30	+-00-+	50	+--+0+	70	000++-
11	-0-0++	31	0+--+0	51	-+-0++	71	000+-+
12	-0-+0+	32	0+-0-+	52	-+-+0+	72	000-++
13	-0-++0	33	0+-+0-	53	-+-++0	73	000+00
14	0--++0	34	+-0+0-	54	+--++0	74	000+0-
15	--00++	35	-0+-+0	55	--+0++	75	000+-0
16	--0+0+	36	-0+0-+	56	--++0+	76	000-0+
17	--0++0	37	-0++0-	57	--++0	77	000-+0
18	-+0-+0	38	+-00+-	58	-+-0++	78	+++--0

Table 1: A Portion of the 8B6T Code Table

University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Final Examination **Fall-2023** **3rd year, 1st Semester**

Course Code: CSE 311 Course Title: Microprocessors and Assembly Language Credit: 3

Time: 3.00 Hour. Full Mark: 50

There are **Five** Questions. Answer all of them. Part marks are shown in the margins.

1. a. A microprocessor is called the 'brain' of a computer- why? Draw the block diagram of 8086 architecture. **[5]** **[CO1]**

   b. How does pipelining increase the speed of a processor? Explain from 8086 architecture. **[5]** **[CO1]**

2. a. Find out the addressing modes of the operands present in the following instructions (Both Source and Destination) and calculate the physical address of the memory operands only: **[8]** **[CO2]**

   i. CMP AL, [BX]

   ii. SUB AX, DX

   iii. MOV AX, A[SI]

   iv. MOV AX, [DI]

   v. CALL SUM

   vi. HLT

   vii. IN AX, DX

   viii. MOV AL, A[BX][SI]

   where, SS=0123h, DS=0124h, ES=0987h, CS=0678h, IP=0956h, SI= 0456h

   DI= 0378h, BX=0567h, A=09h, SUM=0089H.

   b. Write a short note on relative addressing mode. Differentiate intra segment and inter segment addressing modes. **[2]** **[CO2]**

3. a. What will be the value of SP after executing following instructions? Explain using diagrams. [5] [CO1
   i. . STACK 100H
   ii. PUSH AX
   iii. POP AX
   iv. PUSHF
   v. RET

   b. Write a procedure to add two numbers. What is usage of stack during a procedure call. [5] [CO2]

4. a. Take three integer values x,y,z from user , where 0 <= x,y <= 4, x>y, and z = 0 or 1. [6] [CO3]

   If z=0 print x*y (MUL X,Y) and if z = 1 print x/y (DIV X,Y) in the console.

   b. Take an input n & calculate the sum of the series up to 10th term. The [4] [CO3]

   series is 10+ 9 + 8 + 7 + 6+ 5 + 4 + 3 + 2 + 1

OR

   a. Input three integer values x,y,C from user where 0 <= x,y <= 9, and C = 0 or 1. [6] [CO3]

   If C=0 print the minimum of x,y and if C = 1 print the maximum of x,y

   b. Write an assembly program to find out the sum of the odd numbers up to N terms. [4] [CO3]

   e.g. 1+3+5+7+.....

5. a. Write the logic instructions to do the followings [5] [CO4]

   i. Clear LSB of AL

   ii. Set MSB of AL

   iii. Complement AL

   iv. Toggle bit 4 of AL

   v. TEST MSB of AL is 1/0

   b. Find out the output of the following instructions: [5] CO4

   i. ROL AL,1

   ii. RCL AL,1

   iii. SAL AL, 1

   iv. MOV CL,2

   SHR AL, CL

   v. SAR AL, 1

   [Consider initial value of AL is Last two digits of your ID]

University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Final Examination **Fall-2023** **3rd year 1st Semester**

Course Code: CSE 307 Course Title: Theory of Computation Credit: 3

Time: 3.00 Hour. Full Mark: 50

There are **Five** Questions. Answer all of them. Part marks are shown in the margins.

1. a. **Solve** the DFA minimization task using table construction algorithm. [5] [CO3]

	0	1
→m	n	q
n	o	r
*o	p	t
p	q	t
q	r	u
*r	s	n
s	t	n
t	u	o
*u	m	q

b. **Construct** the grammar of *palindromes* over the stings of 0 and 1. **Build** a parse tree for the string '*010101010*'. [5] [CO3]

2. a. **Define** the *Pumpimg Lemma*? **Why** is it used? [5] [CO

b. **Write** down the formal definition of *Turing Machine*. [5] [CO

OR

a. **Write** down the formal definition of *Pushdown Automata*. [5] [CO

b. **Define** *alphabet* in context of automata. Suppose if $\sum$ is an alphabet and $\sum=(0,1)$, then **find** out $\sum^3$. [5] [CO

3. a. **Build** a *Turing Machine* that will accept all stings consisting of *x*, *y* and *z* only and in the form $x^n y^n z^n$. [5] [CO2]

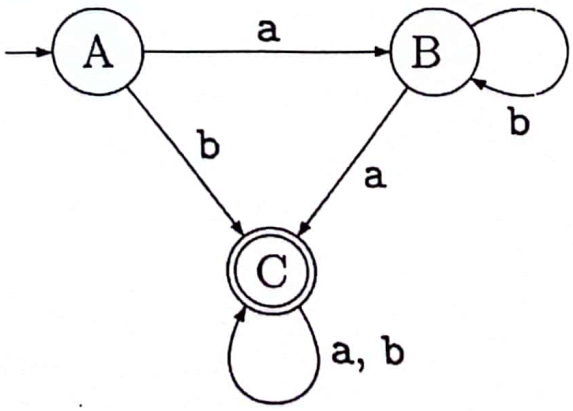
b. **Construct** a *Pushdown Automata* that recognizes [5] [CO2]
i) $\{a^{n+1}b^n \mid n >= 0\}$

4. a. **Build** a DFA that will accept all strings of only 0 and 1 that will start with '0111' or end with '1010'. [5] [CO2]

b. **Construct** the DFA from the following ε-NFA: [5] [CO2]

	ε	p	q	r
→m	{n,o}	Θ	{n}	{o}
	Θ	{m}	{o}	{m,n}
*o	Θ	Θ	Θ	Θ

a. **Translate** (convert) a *regular expression* from the following NFA: [5] [CO2]



b. **Translate** (convert) the following regular expression into ε-NFA: [5] [CO
$(0+1)^*01(1+0)^*1$

University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Final Examination **Fall-2023** **3rd year 1st Semester**

Course Code: CSE 309 Course Title: Object Oriented Programming II:Visual and Web Programming Credit: 3

Time: 3.00 Hour. Full Mark: 50

There are **Five** Questions. Answer all of them. Part marks are shown in the margins.

1. Write a Python function called **pass_or_fail** that takes **two** arguments: a dictionary of student grades and a minimum passing grade. The function should calculate the average grade for each student and create a list of students who pass (i.e., whose average grade is greater than or equal to the passing grade). Finally, it should return this list of passing students. **[CLO1]** **[10]**

**You only need to write the function, do not have to call it.*

Use the following sample data as an example:

```
grades_dict = {
  "Alice": [85, 90, 88],
  "Bob": [70, 75, 72],
  "Dane": [10, 25, 32],
  "Charlie": [92, 88, 95]
}
passing_grade = 40
```

Sample output:
function returns: ['Alice', 'Bob', 'Charlie']

2. You are developing a software system for managing a library. In this system, you want to create a hierarchy of classes to represent different types of items that can be borrowed from the library, such as books and magazines. Each item should have common attributes like **title, author and publication date.** [CLO2]

a. Write a Python class called **LibraryItem** which is an abstract class representing an item in the library. The **LibraryItem** class should define the following abstract methods: [4]
   - **display_details**(self) - Abstract method to display the details of the library item.
   - **borrow**(self) - Concrete method to display a message.
   - **return_item**(self) - Concrete method to display a message.

b. Additionally, create two subclasses of **LibraryItem**: [6]
   - **Book** - Representing a book in the library. It should have an additional attribute called **isbn.** Also, override methods accordingly.
   - **Magazine** - Representing a magazine in the library. It should have an additional attribute called **issue_no.** Also, **override** methods accordingly.
   - Now make an object of **LibraryItem**, **Book** and **Magazine** and call their methods.

2. (OR)

You are developing a system to manage employees in a company. In this system, you want to create a hierarchy of classes to represent different types of **Employee,** such as **Full_Time_Employees, Part_Time_Employees**. Each type of employee should have common attributes like **name, age, and salary**. [CLO2]

a. Write a Python class called **Employee** which serves as the base class for all types of employees. The **Employee** class should have the following attributes and methods. [4]

   Attributes: name, age, salary

   Methods:

   - __init__(self, name, age, salary)- Constructor to initialize the attributes.
   - display_details(self) - Method to display the details of the employee.

b. Create two subclasses of Employee:

- **FullTimeEmployee**: Representing a full-time employee. Implement this class to include an additional attribute **bonus** representing the bonus amount. Also, add a method **calculate_total_salary(self)** to calculate the total salary including bonus. [6]
- **PartTimeEmployee**: Representing a part-time employee. Implement this class to include an additional attribute **hours_worked** representing the number of hours worked. Also, add a method **calculate_payment(self, hourly_rate)** to calculate the payment based on the hourly rate.

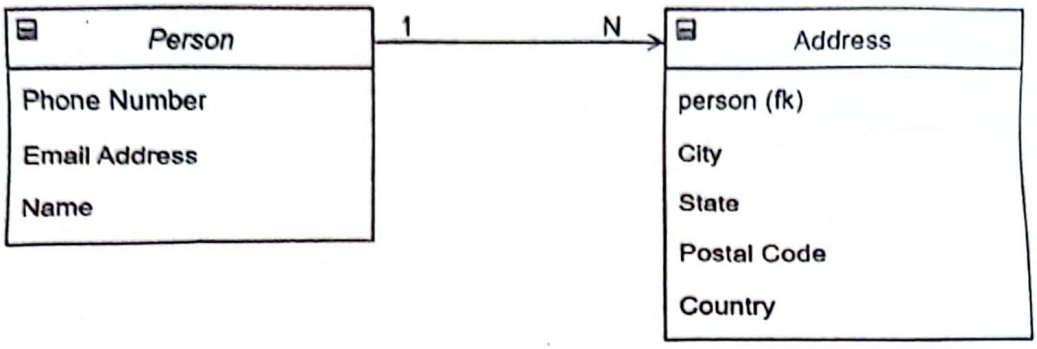
Each subclass should inherit from the Employee class and have its own constructor to initialize its specific attributes.

3. University of Asia Pacific is seeking enhancements to its course management system to efficiently manage information about instructors and the courses they teach. A crucial requirement is establishing a clear linkage between **courses** and their respective **instructors**, while ensuring that each course is taught by only one instructor, but one instructor can teach several courses. [CLO4]

a. Create a solution for this problem by drawing the class diagram containing 2 classes, **Course** and **Instructor** along with at least 3 relevant attributes and foreign keys(if necessary). [4]

b. Define the models based on the class diagram, with necessary description of the attributes. [6]

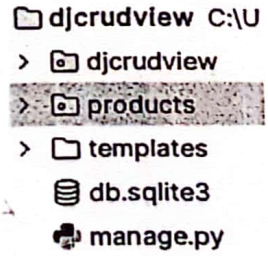
4. Here is a simple class diagram, answer the following questions based on this. [CLO 3]



a. Define both the models in models.py. [4]

b. Define the **AddresForm** in forms.py py for Address class considering we will not take the **person(fk)** input. Utilizing the AddresFrom write the **create_address**(request) function which will create an Address object where we will set the current user (Considering the user is a Person object) as the person. [6]

5. Suppose this is a project structure where **djcrudview** is the main app. [CLO 3]



a. *Write down the process of* **creating and connecting** "products app" along with connecting the urls.py with the main app's (djcrudview) urls.py. [4]

b. Write down the process of uploading the media in a model inside the product app such that we can add product objects from the django admin. Make migrations if necessary. [6]

University of Asia Pacific

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Final Examination | **Fall-2023** | **3rd year 1st Semester**

Course Code: HSS (CSE) 301 Course Title: English II: English for Communications Credit: 2

Time: 2.00 Hours *Full Mark: 50*

There are seven questions. Answer all of them. Part marks are shown in the margins.

1. Read the passage carefully and answer questions a and b.

Almost Human?

Robots become more and more like people. At Aizo Chuo Hospital in Japan, employees greet newcomers, guide patients to and from the surgery area, and print out maps of the hospital for confused visitors. They don't take lunch breaks or even get paid. Why? They're robots!

A robot is a machine that can complete complex tasks without human control. The child-sized machines at the hospital are just a few of the thousands of robots that help people around the world. Robots have long worked in factories, helping to build cars and electronic appliances. But today's robots are a far cry from the clunky machines of the past. They don't just do the jobs of people—they actually look and act a lot like people.

Helping Humans

Robot communication will allow the machines to help people more in the future, as the number of human workers declines in some countries. "We are going to have so many more old people and not enough young people to take care of them," Matthew Mason, director of the Robotics Institute at Carnegie Mellon University told WR News. "Technology can help the old people live at home longer, instead of going to nursing homes." That would be a big help in Japan, which has an aging population. Already, more than 370,000 robots work in Japanese factories. Other robots perform tasks such as planting rice and tending the country's rice paddies. Japanese officials estimate that one robot can do the work of 10 human employees.

However, Aizo Chuo Hospital patient Hiroshi Asami, 81, isn't thrilled about the prospect, or possibility, of robot workers. "[The robot] just told us to get out of the way!" he exclaims after almost running into one of the hospital's robot workers. "It's a robot. It's the one that should get out of my way. I prefer dealing with real people."

a. Write short answers to the following questions. **4x1 = 4**

i. What could be another good title for this passage?

ii. Why might a patient prefer to interact with a real person instead of a robot?

iii. What are some tasks mentioned in the passage that robots in Japan perform besides working in factories?

iv. According to Matthew Mason, what demographic challenge does technology aim to address in th future?

b. Match the contextual meaning with the following words/expressions. 6x1 = 6

prospect	old-fashioned
far cry	intricate
clunky	potential
appliance	afraid
thrilled	unembellished
complex	device
	excited
	very different from something

2. Complete the following sentences using proper conditionals. 5x1 = 5

a. If you enter the wrong password, the system _____(deny) access.
b. If the IT department _____(train) employees on cybersecurity awareness, the company wouldn't have fallen victim to phishing scams.
c. If he _____ (save) money regularly, he could afford to buy a house.
d. If they had not missed the train, they _____(arrive) on time.
e. If it _____ (not rain) tomorrow, we could go for a picnic.

3. Change the following sentences as directed. 5x1 = 5

a. In spite of the network latency issues, the code was executed flawlessly. (make it compound)
b. Weather permitting, the match will be held tomorrow afternoon. (make it complex)
c. Although the application has many features, it lacks documentation. (make it simple)
d. The programming language is too difficult for the users to understand. (make it compound)
e. Without proper encryption, sensitive data in the computer will be vulnerable to hacking. (make it complex)

4. Identify the linking words from the passage and replace them with synonymous linking words (at least five). 5x1 = 5

In contemporary society, technological advancements have revolutionized various aspects of our lives. With the proliferation of smartphones, individuals can now access information instantly, facilitating seamless communication across geographical boundaries. Additionally, social media platforms serve as conduits for sharing ideas, fostering connections, and cultivating communities. Moreover, e-commerce platforms have transformed the retail landscape, offering unparalleled convenience and accessibility to consumers worldwide. However, alongside these benefits come challenges, such as concerns regarding privacy and security. Despite these challenges, technological innovation continues to accelerate, driving progress in fields like healthcare, education, and transportation. Consequently, societies are becoming increasingly interconnected, as globalization facilitates the exchange of goods, services, and ideas on a global scale. Nevertheless, amidst this interconnectedness, disparities persist, highlighting the importance of equitable access to technology

and resources. Thus, while technology has the potential to enhance lives and drive positive change, it also necessitates careful consideration of its societal implications and ethical ramifications.

5. Write a memo issued by the Project Officer of Transparency LTD. regarding the seminar scheduled to be held later this month on "Accommodation problems in Dhaka". **5x1 = 5**

6. Write an inquiry letter to the Admission of Michigan State University, USA asking about the application procedure, required qualifications and scholarship facilities for international students. **10x1 = 10**

7. Imagine recently UAP had arranged Inter-University Robotics Competition, 2024. The competition took place in the UAP auditorium. Eleven groups from eleven different universities of Bangladesh participated in the competition and Department of CSE, UAP became the champion. Now, write a report on the event for the latest *Quarterly Newsletter* published by UAP in no more than 200 words. **10x1 = 10**

GOOD LUCK!