

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Spring-2024

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. **Analyze the OSI model by explaining the specific functions and interactions of each layer. Evaluate how data flows from one device to another, addressing the roles of individual layers in ensuring communication reliability and efficiency.** [5] [CO1]
1. b. **Create a comprehensive diagram of a data transmission system (also known as components) that shows the data flow in a node-to-node communication structure and discuss several transmission medium types / communication channels (wired and wireless).** [3+2 =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". Analyze the encoding process comprehensively and construct a schematic diagram to illustrate the encoding of the provided binary sequence.** [5+2 =7] [CO2]
2. b. **The signal input power and input noise power of an amplifier are 150 microwatts and 1.5 mW, respectively. However, the noise power is 40 mW and the output signal power is 1.5W. Consequently, determine the noise function and noise figure.** [3] [CO3]

OR

- a. **Construct the following digital signal diagram, if you want to send a data packet, 010101101 to your friend. Show the line coding schemes. Consider that the previous voltage was positive. Among these which one will perform better if it faces long streams of 0's.** [1.5 x4+ =7] [CO2]
 - i. NRZ-L
 - ii. AMI
 - iii. Manchester (IEEE)
 - iv) Differential Manchester

- b. Without a repeater, there is a 50-kilometer single-mode fiber optic communication link with a loss of 0.2 dB/km. Every two kilometers, fiber is linked using splices that have a 0.5 dB loss. Determine the minimum average power that must be launched into the fiber to maintain a 10 mW average power level at the receiver? [3] [CO3]
3. a. Apply the LRC method to encode the IP address 192.168.10.1 for error detection during data transmission. Calculate and demonstrate the LRC providing detailed steps. Furthermore, evaluate the performance of the LRC method by discussing its strengths and limitations in ensuring data integrity. [4+2 [CO3]
=6]
- b. Analyze the difference between Dense Wavelength Division Multiplexing (DWDM) and Coarse Wavelength Division Multiplexing (CWDM) in terms of their principles, applications, and advantages, and the impact of guard bands. [4] [CO3]
4. a. Host A wants to send 10 frames to host B. The hosts agreed to go with GO-BACK-4. Examine, how many frames are transmitted by host A if every 6th frame that is transmitted by host A is either corrupted or lost? [4] [CO4]
- b. A small office network relies on a single wireless router that operates on the 2.4 GHz band, which is part of the "free" radio spectrum used by 802.11. The office has multiple devices connected, including laptops, smartphones, and IoT devices. During work hours, employees frequently experience slow internet speeds and interruptions in video calls. Upon investigation, it is discovered that the network is facing interference from nearby wireless networks and devices such as microwaves, which also operate on the 2.4 GHz band. [2x3 [CO4]
=6]
- Using this scenario:
- Explain the challenges the router faces due to its reliance on the 2.4 GHz spectrum.
 - Compare the available spectrum options (e.g., 2.4 GHz vs. 5 GHz) and their impact on performance.
 - Recommend potential solutions to improve network reliability and mitigate interference in this setup.
5. a. Explain the key components and workings of Free Space Optics (FSO) technology and analyze its role in enhancing communication within optical wireless network architectures. [4] [CO4]
- b. How does the modulation bandwidth differ between phosphor-based LEDs and RGB LEDs for white light production techniques? Explain with the help of a diagram. [2] [CO4]
- c. Illustrate a hybrid network topology to connect nine PCs distributed across three rooms, with three PCs in each room. Select and justify one topology to connect the PCs within each room and another topology as a backbone to interconnect the three rooms. Illustrate the complete network architecture with a detailed diagram, and explain how the chosen topologies work together to ensure efficient communication. [4] [CO1]

Table 1: A Portion of the 8B6T Code Table

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

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Spring-2024

3rd Year 1st Semester

Course Code: CSE 305 Course Title: System Analysis and Design

Credit: 3

Time: 3.00 Hours.

Full Mark: 50

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

1. a. Explain the purpose of using Sequence Diagram. [5] [CO1]
- b. Describe the context level of Data Flow Diagram (DFD) with example. [5] [CO1]
2. a. ABC Inc. is considering two projects, namely Project X and Project Y, and wants to calculate the Net Present Value (NPV) for each project. Both Project X and Project Y are four-year projects, and the cash flows of both projects for four years are given below: [7] [CO2]

Year	Project A Cash Flows	Project B Cash Flows
1.	5000 /=	1000 /=
2.	4000 /=	3000 /=
3.	3000 /=	4000 /=
4.	1000 /=	6750 /=

The company's cost of capital is 10% for each project, and the initial investment amount is Taka 10,000 /. Calculate the NPV of each project and determine which project the company should invest in.

- b. If the rate of return is 10%, what would be the Net Present Value (NPV) of a box of fruits with the price at Taka 20,000 and a year later it costs Taka 45,000. [3] [CO2]

3. a. Compare between Activity Diagram and Class Diagram. [5] [CO3]
- b. Differentiate between Entity Relationship Diagram (ERD) and Data Flow Diagram (DFD). [5] [CO3]
4. Technology has completely transformed the field of medicine, as it has with most industries. A Hospital Information System helps doctors, administrators, and staff to manage all the activities and information collected at a hospital, including checkups, prescriptions, appointments, and information on the patients and their caretakers. Design an Activity Diagram for a Hospital Information System with a brief description. [7-3] [CO4]
5. a. University of Asia Pacific (UAP) decided to investigate the use of an Online Registration System. Professors can use this system to indicate the courses they would teach, students can use it for selecting courses, the registrar can use it to complete the registration process, and the billing system, which is an external system that bills students each semester. Design a Use Case Diagram for the Online Registration System and briefly describe each Use Case. [7-3] [CO4]

OR

5. b. An online railway reservation consists of the following activities. A Passenger can reserve a ticket, cancel a ticket and enquiry. Each train has limited number of reserved seats. Once a passenger cancels a ticket, s/he is refunded and the waiting list passenger is allotted the seat. Passenger may also book a ticket in ABC scheme by paying additional amount. Passenger who booked the ticket under ABC scheme can't get any refund if the ticket is cancelled. The chart is prepared two hours before the departure of the train. Design a class diagram for the given scenario with a brief description. [7-3] [CO4]

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Spring-2024

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. Build a Turing Machine that will accept all strings consisting of a, b and c only and [5] [CO2]
in the form $x^n y^n z^n$
b. Build a Pushdown Automata that will accept any binary string of the form $0^n 1^n$. [5] [CO2]
Prove that 000111 is accepted by this PDA.

2. a. Write down the formal definition of Turing Machine. [5] [CO1]
b. Write down the formal definition of Context-free Grammar. [5] [CO1]

OR

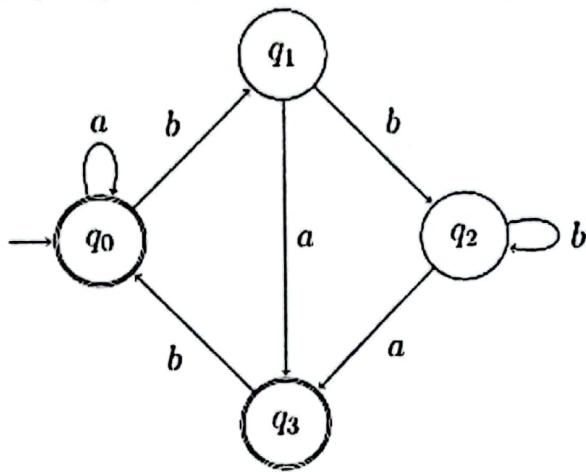
- a. Write down the formal definition of Pushdown Automata. [5] [CO1]
b. Write down the formal definition of Regular Language. [5] [CO1]

3. a. Simplify the following DFA: [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. Compare the leftmost and rightmost parse tree for "110011" and "0101010" for a context free grammar for palindromes. [5] [CO3]

4. a. Develop a regular expression from the following NFA: [5] [CO2]



- b. Convert the following regular expression into ϵ -NFA: [5] [CO2]
 $(a+b+c)^* + (a+c)(b+c^*) + b^*$

5. a. Build a DFA that will accept all strings of only 0 and 1 that has '01' as substring and ends with '10'. [5] [CO2]

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

	0	1	ϵ
$\rightarrow a$	{e}	{b}	\emptyset
b	\emptyset	{c}	{d}
c	\emptyset	{d}	\emptyset
$*d$	\emptyset	\emptyset	\emptyset
e	{f}	\emptyset	{b,c}
f	{d}	\emptyset	\emptyset

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Spring-202

3rd year 1st Semester

Course Code: CSE 309

Course Title: Object Oriented Programming

Credit: 3

II: Visual and Web Programming

Time: 3.00 Hour.

Full Mark: 50

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

1. a. Why do we need try-except blocks if we already have if-else statements? [5] [CLO1]
Write a Python program that takes a number as input from the user and uses a try-except block to handle errors. If the user enters an invalid input (non-numeric), handle the **ValueError** and display an appropriate message. If the user enters 0, handle the **ZeroDivisionError** to prevent a division by zero. The program should attempt to divide 100 by the entered number, print the result if no errors occur

Sample input	Sample custom output
Enter a number: 0	Cannot divide by zero.
Enter a number: hello	Invalid input. Please enter a numeric value.

- b. What is the main difference between a list and a tuple in Python? Explain with code examples and provide use cases for when to use each. Additionally, create a scenario where using a tuple would result in an error. [5] [CLO1]

1 (Or)

[5] [CLO1]

- a. What is the difference between mutable and immutable data types in Python? Provide examples. Discuss an example error.

- b. Write the output of the following code:

[5] [CLO1]

```
my_list = [1, 2, 3, 4, 5]
my_list.append(['hello', 'world'])
print(my_list)
my_list.pop()
print(my_list)
my_list = my_list[::-1]
print(my_list)
my_list = my_list + [1,2,3]
print(my_list)
my_set = set(my_list)
my_set.discard('banana')
my_list = list(my_set)
print(my_list)
```

2.
 - a. What are the key differences between single inheritance and multiple inheritance in Python, and what potential issues can arise when using multiple inheritance? Discuss solutions with example code. [5] [CLO2]
 - b. You are developing a system for an online education platform. The platform has multiple types of users, such as **Students** and **Instructors**. Each type of user has common attributes like name and email, but they also have specific attributes or behaviors: Students have a list of courses they are enrolled in and can view their course list. Instructors have a list of courses they teach and can publish new courses. In this situation, should you use an abstract class or simple inheritance to implement the solution? Why? After deciding, write the Python code to represent this design. [5]. [CLO2]
3.
 - a. What is MVT in django? Explain with a diagram. [5] [CLO 4]
 - b. Create a Django model for a "Blog Post" that includes the following fields: [5] [CLO4]
 - title (a text field for the post title)

- **content** (a long text field for the post content)
- **author** (a text field for the author's name)
- **created_at** (a field to store the creation date and time, automatically set)

Write a Django view function to display a list of all blog posts on the homepage.

4. a. How many types of CSS are there? Explain when to use each type, with example code snippets. Additionally, which one is the best, according to you?

[5] [CLO3]

- b. Output the following table:

[5] [CLO3]

```

<body>
  <table border="01">
    <tr>
      <th rowspan="2">Category</th>
      <th colspan="2">Details</th>
    </tr>
    <tr>
      <th>Name</th>
      <th colspan="2">Attributes</th>
    </tr>
    <tr>
      <td rowspan="2">Group A</td>
      <td>Item 1</td>
      <td>Feature 1</td>
    </tr>
    <tr>
      <td>Item 2</td>
      <td colspan="2">
        <table border="1">
          <tr>
            <td>Sub-feature 1</td>
            <td>Complete</td>
          </tr>
          <tr>
            <td>Sub-feature 2</td>
            <td>In Progress</td>
          </tr>
        </table>
      </td>
    </tr>
    <tr>
      <td>Group B</td>
      <td colspan="2">Special Item</td>
    </tr>
  </table>
</body>
```

5. University of Asia Pacific is building an online routine management system using Django with the theme "by the students, for the students." The system will

[10] CLO[4]

allow section representatives to choose class slots for their sections, following this rule:

- Higher semesters (8th → 1st) get priority.
- Each section can choose one slot at a time, and all sections must take turns.

The system will have the following apps and classes:

1. Users app:
 - Manages section representatives (user details).
2. Sections app:
 - Stores section details like semester and number of students.
3. Bookings app:
 - Manages:
 - a. Available class slots.
 - b. Bookings made by section representatives.

Tasks:

- Draw a class diagram with **at least one class per app** with necessary **attributes** across the above apps.
- Explain With necessary code snippets and commands.
 - How to install Django in this project and create these apps.
 - How to connect the apps in the project.
- If media fields are used (e.g., profile pictures), how will you handle them?
- Explain without coding, how to enforce the slot selection rule (higher semesters go first, sections take turns).

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Spring - 2024

3rd Year 1st Semester

Course Code: CSE 311

Course Title: Microprocessors and Assembly Language

Credit: 03

Time: 3.00 Hours

Full Mark: 50

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

1. a. What are the different types of registers in the 8086 microprocessor? Mention their names. Explain the functions of AX and CX Registers. [6] [CO1]
b. Define the control flags (TF, DF, IF) and their application. [4] [CO1]
2. a. 'BIU and EU can work in parallel with the help of instruction queue'- Explain from pipelining feature. [4] [CO2]
b. Differentiate between logical and physical address. Show the process to calculate the physical address (20-bit) from logical address (segment: offset). If segment register value is =0123H, find out the starting and ending address.
[Hint: Offset Range is 0000H to FFFFH] [6] [CO2]
3. a. What is memory banking and how does it solve the issue 16-bit data transfer in the 8086 microprocessors? Explain with diagram. If the address bus of a processor is 32-bit then how many banks it will require? [5] [CO1]
b. Find out the addressing modes of the instructions in the followings and calculate the physical address only for the memory operands:
i. ADD AX, [BP+50H]
ii. CMP AX, DX
iii. MOV AX, A[SI]
iv. JMP L
v. SUB AL, A[BX] [SI]
where, SS=0123H, DS=0124H, ES=0987H, CS=0678H, IP=0956H, SI= 0456H
DI= 0378H, BX=0567H, A=09H, BP = 0100H [5] [CO2]
4. a. What are the differences between SHR and SAR? Explain with appropriate examples. AL= Last two digits of your registration number in Hex (if required) [5] [CO3]

convert it into Binary), BL=02H and CL=02H, then find out the final value of AL after execution of the followings

- i. ROL AL, 1
- ii. SAR AL, 1
- iii. RCR AL, CL
- iv. MUL BL
- v. DIV BL

[Hint: Use Shift instruction to multiplication and division],

- b. Suppose AL= (Last two digit of your Registration number) H, write the corresponding logic instruction with the necessary mask bit pattern to do the followings: [5] [CO3]
- i. Set bit 1,3,5
 - ii. Reset bit 2, 4, 6
 - iii. Complement bit 5,6
 - iv. Toggle AL
 - v. No change AL
5. a. Write an assembly program to input three integer numbers, and another variable C, and do the followings: [8] [CO4]
- i. If C= 0, then find out the maximum value
 - ii. If C= 1, then find out the minimum value
- b. Using TEST instruction find out the LSB of AL is 0/1. [2] [CO4]

OR

- a. Write an assembly program to count the number of characters until 'ENTER' key is pressed from keyboard. [8] [CO4]
- [Hint: Initially declare COUNT variable as 0 and ASCII value of 'ENTER'= 0DH]
- b. Write an assembly program to count the series [2] [CO4]
- 1+3+5+7.....N
- [Hint: you consider a value for N]

University of Asia Pacific
Department of Computer Science & Engineering
Final Examination, Spring 2024
Program: B.Sc. in Computer Science & Engineering
3rd Year 1st Semester

Course Title: English II: English for Communications

Time: 3 hours

Credit Hour: 2.00

Course Code: HSS (CSE) 301

Full Marks: 50

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

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

Coffee, the beloved elixir that has woven its way into the daily rituals of millions around the world, is more than just a beverage—it's an experience. From the deep, earthy aroma of freshly ground beans to the rich, comforting warmth of a steaming cup, coffee awakens the senses in a way few other drinks can. Its origins trace back centuries to the highlands of Ethiopia, where legend has it that a goat herder named Kaldi discovered the energizing effects of the coffee cherry.

From Ethiopia, coffee spread into the Arabian Peninsula, where it became a vital part of the social and religious landscape. By the 15th century, the Yemeni port city of Mocha had become a central hub for the coffee trade. It was in this region that coffee was first cultivated and refined into the drink we recognize today, with brewing techniques and the first coffeehouses—called *qahveh khaneh*—beginning to emerge. These coffeehouses became vibrant centers of intellectual and cultural exchange, where people gathered to discuss everything from politics to poetry.

Coffee reached Europe in the 17th century, and its impact was profound. In Venice, coffee was first introduced in 1645, and soon after, it made its way to England, where the first coffeehouse opened in 1652. These early European coffee houses became hotbeds for conversation, attracting intellectuals, merchants, and artists. In England, they were dubbed “penny universities,” as patrons could engage in lively discussions for the cost of a coffee. It was also during this time that coffee became tied to the rise of the global colonial economy. (261 words)

a. Write short answers to the following questions.

[5]

- i. Give a suitable title to the passage.
- ii. By whom and where was coffee first discovered?
- iii. What was the name of the first coffeehouses and when were they established?
- iv. What does the term “penny universities” mean?
- v. When was the first coffeehouse of Europe established?

b. Match the contextual meaning with the following words/expressions.

[5]

Elixir	Intense
Herder	Surface
Emerge	Shepherd
Vibrant	Potion
Profound	Nurture
	Energetic
	Scent

2. Change the voice of the following sentences as instructed.

[5]

- Has the database been backed up by anyone? (Change into Active)
- The team will deploy the application next week. (Change into Passive)
- The requirements were being reviewed by the project manager. (Change into Active)
- Do not share your password with anyone. (Change into Passive)
- They developed the new software version last year. (Change into Passive)

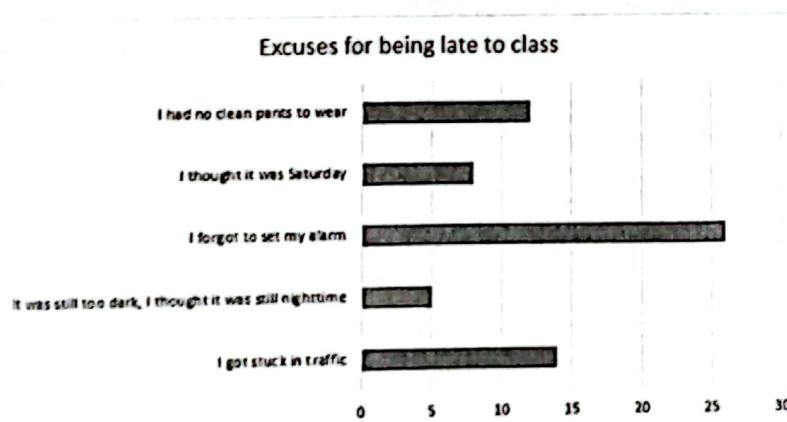
3. Transform the following statements into interrogative sentences.

[5]

- The sun rises in the east. (closed question)
- They are going to the beach tomorrow. (WH-word question)
- She speaks three languages fluently. (WH-word question)
- The movie was interesting. (closed question)
- She works at a law firm in the city. (WH-word question)

4. The chart shows the reasons the students of the CSE department were late for class during the spring semester. Summarize the information by selecting and reporting the main features, and make comparisons where relevant.

[10]



5. Suppose UAP had arranged the Inter-department Drama Competition 2024. The competition took place in the UAP auditorium. Now, write a report on the event for the latest *Quarterly Newsletter* published by UAP. [10]

6. Imagine that you are a graduate with a degree in Computer Science and Engineering (CSE), applying for a position at a reputable tech company named Chroma Creations. Now, write a cover letter that effectively highlights your skills, experiences, and qualifications to secure the job interview. [10]

GOOD LUCK!