ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION   SUMMER SEMESTER, 2022-2023
DURATION: 3 HOURS   FULL MARKS: 150

CSE 4281: Computer Programming

Programmable calculators are not allowed. Do not write anything on the question paper.
Answer **all 6 (six)** questions. Figures in the right margin indicate full marks of questions with
corresponding COs and POs in parentheses.

1. a) What is software? What purposes does the system software serve?   3 + 5
                                                                                      (CO1)
                                                                                      (PO1)

    b) Explain how the device drivers help to run peripheral devices connected to the computer.   7
                                                                                      (CO1)
                                                                                      (PO1)

    c) Write a Python program where you are prompted to input your student ID. Subsequently,   10
    the program should check whether the entered student ID is even or odd. In case the input   (CO3)
    is not a numeric value, an error message should be displayed.   (PO1)

2. a) Differentiate between the working principles of compilers and interpreters.   8
                                                                                      (CO1)
                                                                                      (PO1)

    b) Discuss the functional scopes and generations of machine language, assembly language, and   7
    high-level language.   (CO1)
                                                                                      (PO1)

    c) Write a Python program where you are prompted to input your name. Subsequently, the   10
    program should check the number of vowels in your name. In case the input contains any   (CO3)
    numeric value, an error message should be displayed.   (PO1)

3. a) Explain how the operating system works as a mediator between the user and the computer   6
    hardware.   (CO1)
                                                                                      (PO1)

    b) Consider Figure 1 where four CPU processes are depicted. The processes appear to the CPU   12
    from left to right. The CPU time needed by each process is indicated in brackets.   (CO1)
                                                                                      (PO1)

Figure 1: CPU Processes for Question 3.b

Illustrate two cycles for each of the FCFS, SJF, and RR scheduling algorithms for these four
processes. Assume a time quantum of four units for RR scheduling.

c) Write the output of the Python code snippet provided in Code Snippet 1:   10

```
1  numbers = [1, 3, 5, 7, 9, 10, 11, 12]
2  new_numbers = []
3
4  for num in numbers:
5      if num % 2 == 0:
6          new_numbers.append(num + 2)
7      elif num % 3 == 0:
8          new_numbers.append(num + 3)
9      elif num % 5 == 0:
10         new_numbers.append(num ** 2)
11     else:
12         new_numbers.append(num - 1)
13
14 print(new_numbers)
```

Code Snippet 1: Python code snippet for Question 3:c

4. a) Figure 2 depicts two CPU processes and two resources to be shared among these processes.   8 + 7

Figure 2: CPU Processes & Resources for Question 4.a

Answer the following questions based on figure Figure 2:

   i. Describe the four conditions that must be fulfilled to trigger a deadlock between these two processes.

   ii. Draw the hold-wait interactions between the processes and resources in Figure 2 during a deadlock.

b) Which data structure (list, dictionary, tuple, or set) would you use to store employee data in a large government office? Choose appropriate data structure based on the accessibility of data and ease of visualization.   10

5. a) What does paging mean in the context of operating systems? How does virtual memory utilize paging to run large CPU processes?   2 + 5

b) Figure 3 shows free memory allocation in a memory block of primary memory. To run a process requiring 8 KB of memory, illustrate the places and sizes of fragmentation created using different hole allocation strategies. Allocation starts from point S of Figure 3.   8

Figure 3: Free memory locations for Question 5.b

c) One approach for copying a Python list is to reassign a new list. For example, *new_list* = *old_list*. Describe the risk of this approach. Explain the reason behind this risk. Provide an alternative solution.

7
(CO1)
(PO1)

6. a) Write a Python program for the flowchart depicted in Figure 4.
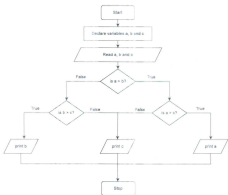
15
(CO1)
(PO1)

Figure 4: Flowchart for Question 6.a

b) Convert $(35)_{10}$ to its corresponding binary, octal, and hexadecimal form. Show all the required calculations for conversion.

10
(CO1)
(PO1)