The Open University of Sri Lanka
Faculty of Engineering Technology
B.SE. Honours Degree Programme

Department	: Electrical and Computer Engineering
Level	: 3
Name of the Examination	: Final Examination
Course Title and - Code	: EEX3467 - Software Engineering Concepts and Programming
Academic Year	: 2024/25
Date	: 13/08/2025
Time	: 9.30am – 12.30pm
Duration	: 3 hrs.

General Instructions

1. Read all the instructions carefully before answering the questions.
2. This question paper consists of **four (4)** questions in **six (6)** pages.
3. Answer all **four (4)** questions. Each question carries equal marks.
4. Answer for each question should commence from a new page.
5. Draw fully labelled diagrams where necessary.
6. Write answers in clear and concise format appropriately in points/bullet form.
7. This is a Closed Book Test (CBT).
8. Involvement in any activity that is considered as an exam offense will lead to punishment.
9. Use blue or black ink pen to answer the questions.
10. Clearly state your index number in your answer script on every page.

QUESTION 1 [25 Marks]

Read the following description of *TechZone Gaming* and answer the parts of QUESTION 1.

TechZone Gaming Center provides two types of gaming memberships: Basic and Advanced. Each member is billed monthly based on the number of gaming sessions attended. One session means 15 Minutes of gaming time. For Basic members, the monthly charge includes a fixed registration fee of Rs. 800 and Rs. 300 per session. If more than 10 sessions are attended, a 5% discount is applied. For Advanced members, the monthly charge includes the Basic member fee calculation plus an Rs. 1500/= technology access fee. If more than 15 sessions are attended, a 10% discount is applied.

a) Briefly describe the following with your own words,

(i) Top-Down approach in software engineering [4 Marks]

(ii) Local and Global Variables in programming [4 Marks]

(iii) Data Flow Diagram [4 Marks]

Note - Briefly describe each. (No detailed explanations are needed.)

b) The following is a sample C program code that calculates the monthly membership fee for TechZone Gaming Center, based on whether the user has a Basic or Advanced membership and how many sessions they have attended. However, the given code is incomplete. Complete the program by writing your answers in the answer book with the respective number of the blank space. If you find the program incorrect or incomplete even after filling in the blanks, you may proceed with reasonable assumptions. Please make sure to clearly state any assumptions in your answer script. [13 marks]

```
#include <____(1)____>

int main() {
   int membershipType;
   int sessions;
   float totalFee = 0.0;
   // Display options
   printf("TechZone IT Gaming Center Membership Fee Calculator\n");
   printf("Select membership type:\n");
   printf("1. Basic\n");
   printf("2. Advanced\n");
   printf("Enter your choice (1 or 2): ");
   scanf("%d", &membershipType);
   // Input number of sessions
   printf("Enter the number of gaming sessions attended: ");
   scanf("%d", &sessions);

   // Calculate fee
   if (_____(2)_____ == 1) {
      // Basic Membership
      totalFee = 800 + (___(3)___ * 300);

      // 5% discount if more than 10 sessions
      if (sessions > 10) {
         ___(4)____ *= 0.95;
      }

   } else if (___(5)____ == 2) {
      // Advanced Membership includes Basic + Rs. 1500 tech access fee
      totalFee = 800 + (___(6)____ * 300) + 1500;

      // 10% discount if more than 15 sessions
      if (sessions > ___(7)___ ) {
         totalFee *= 0.90;
      }
   } else {
      printf("Invalid membership type selected.\n");
      return ___(8)___ ;
   }
   // Display the result
   printf("Total membership fee for the month: Rs. %.2f\n", ____(9)____);

   return ___(10)___ ;
}
```

QUESTION 2 [25 Marks]

Consider the scenario below for a University Course Registration System.

A university course registration system includes students, academic advisors, course coordinators, and system administrators. Students can see available courses, sign up for them, drop them, or ask for special permission to join. Academic advisors approve these special requests and check students' study plans. Course coordinators handle course information and scheduling. System administrators watch over the system and manage user access.

a) Describe three (3) functional requirements for this system. [3 Marks]

b) Suggest and describe three (3) non-functional requirements for this system. [3 Marks]

c) Propose a way to enhance the security measures for the proposed system, ensuring compliance with privacy concerns. [4 Marks]

d) Draw a comprehensive use case diagram based on the above scenario, incorporating the underlying concepts of include and extend relationships. [15 Marks]

QUESTION 3 [25 Marks]

a) Briefly explain the stages of the software development life cycle (SDLC). [7 marks]

b) Consider an age-based movie ticket pricing system:

- Ages 0 – 4: Free of charge
- Ages 5 – 17: Rs. 300 per person
- Ages 18 – 59: Rs. 500 per person
- Ages 60 and above: Rs. 250 per person

Suppose you have been recruited as an intern to test this application. Answer the following questions.

(i) Using Equivalence Partitioning, identify the valid and invalid input partitions for the age ranges in the pricing system. [8 marks]

(ii) Apply Boundary Value Analysis to the age input and identify appropriate test cases that would effectively test the system around the boundaries. [10 marks]

QUESTION 4 [25 Marks]

Consider the following procedure/pseudo code "**CALCULATE_TOTAL_AND_AVERAGE**" to answer the following questions.

```
PROCEDURE CALCULATE_TOTAL_AND_AVERAGE (Array of integers: Numbers)
Start
Repeat
 // Step 1: Input marks for one student
 Input labTest1
 Input labTest2
 Input onlineQuiz
 Input miniProject
 // Step 2: Calculate average lab test marks
 labAverage = (labTest1 + labTest2) / 2
 // Step 3: Calculate overall marks
 overallMarks = (labAverage + onlineQuiz + miniProject) / 3
 // Step 4: Check eligibility
 If labAverage > 40 AND overallMarks > 40 then
    Print "Student is eligible for the final exam"
 Else
    Print "Student is NOT eligible for the final exam"
 End If
```

// Step 5: Ask user if they want to check another student

Input choice ("Do you want to check another student? (yes/no): ")

Until choice = "no"

END PROCEDURE

a) Draw a flow chart for the procedure/pseudo code given above. [5 marks]

b) Find the Cyclomatic Complexity of the resultant flow graph in sub question part (a). [5 marks]

c) Implement the above pseudocode in C programming language. Your code should prompt the user to input the number of elements (lab test marks, Mini project marks, etc.) for an array and then read and store these elements from user input. Include comments to explain key sections and ensure the code adheres to the pseudocode. Your implementation must be correct, well organized. Make sure to handle input validation and edge cases appropriately. Use any relevant assumptions and write them clearly. [15 marks]

~~End~~