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The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical and Computer Engineering

Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	: EEX3417 Software Development for Engineers
Academic Year	: 2021/2022
Date	: 20 February 2023
Time	: 13.30 to 16.30 hrs
Duration	: 3 hours

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of four (4) questions on four (4) pages.
3. Answer **all four** questions.
4. Answers for each question should commence from a new page.
6. This is a **Closed Book Test** (CBT).
7. Answers should be in clear handwriting (you can use a pencil and eraser to write programs) .
8. Do not use red colour pens.

Question 01

(i) Draw a flow chart for the following pseudo code. Clearly indicate terminations, control structures, processes, inputs and outputs.

```
While not bill is closed
    Scan barcode
    If price>500
        Discount = price*.02
    Else
        Discount = 0
    Display price with discount
    Add price to total
Display total
```

[10 marks]

(ii) Following C program includes reading some values and storing them in an array called "a". After entering values, the program calculates the sum of the values of the array and stores them into a variable called "sum". There are 8 code lines (numbered as follows) yet to be filled by you to complete the required program codes. Write the correct C program codes with the code number in the answer paper.

[10 marks]

```
#include <stdio.h>
// declare and initiate an integer array called "a" with a maximum length of 10.
(1) int _____
int main()
{
   int i=0;
   //declare a variable called "L" and initiate with length of the array -1
(2) _____
   int no=0;
   int sum=0;
   for(i=0;i<=L;i++)
   {
     // Print and input values to the array element
(3)  printf(_____);
(4)  scanf(_____);
   }
   // Calculate sum of array
(5) for(i=0;_____)
(6) _
(7)  _____
(8) _
   // print sum
   printf("\nSum = %d",sum);
}
```

(iii) Write a complete C program to enter marks (limited to 0 to 100) of 10 subjects and find the average marks for all 10 subjects. Answer parts a), b), and c) to complete the program.

a) Write a *function* in *C* to enter marks for 10 subjects and calculate the total of each mark. Use the ***total=total+marks*** For counting the total for 10 subjects. Use 'for' loop for entering marks and calculating the total.

[8 marks]

b) Write a *function* called "***avg***" in *C* to calculate the average of the total for 10 subjects. Parameter to pass through this function is "***total***".

$$\text{average} = \frac{\text{total}}{\text{total no of subjects}}$$

[4 marks]

c) write the main program to enter total marks and average marks and print the average marks. Write functions with correct function calls with parameter passing.

[3 marks]

(iv) This question is based on pointers in a C program. Write the program code for the following description [5 marks]

1. Declare an integer type pointer p1 (use * sign)
2. Declare an integer type variable "result"
3. Assign 10 to the variable "result"
4. Assign the address of the variable to the pointer p1. (use & sign)

Question 02

(i) Read the following scenario and draw the ***object class*** diagram and their relationships in the given scenario and write suitable attributes and their data type for each class.

[10 marks]

In a University, details of students include the registration number(reg_no), and the program code (prg_code). Details of staff include staff id (staff_id), salary code (sal_code). Details of both staff and students (person) include NIC number (NIC_no), name, age, address and date of birth (dob). A department has a department code (dep_code) and a list of one or more staff members.

(ii) Draw a use case diagram for the following description, including name, boundary, use cases, actors and relationships. **[10 marks]**

There are 3 base use cases in a pizza ordering system: order pizza, payment, and notification when the pizza is cooked. A customer can place an order for pizza after selecting the pizza size. When ordering pizza, ordering drinks is optional. After ordering pizza, the customer pays the total payment to the cashier. Finally, the chef cooks pizza after confirming the pizza order and notifies the cashier when cooking is over.

Question 03

Consider the following relational schema for a database called Books that holds data about books in a library.

Books(Title, ISBN, Author name, Author nationality, Author address, publisher name, publisher address, total_copies_ordred, Copies_in_hand, publication_date, category, category_description)

Assume the following,

ISBN number is unique

A book may have more than one author

An author may have written more than one book

Each publisher name is unique and each publisher has a unique address.

Book Titles are not unique

Each book has only one publication date and one publisher. A revision of a book is given a new ISBN.

Categories are unique. Categories could be: biology, poetry, computer vision etc.

Write clearly, any other assumptions that you need.

(i) Draw an E-R diagram for the given data. Underline the primary key. Clearly show the cardinality. [10 marks]

(ii) Normalize the data upto 3 rd normal form. Indicate the primary keys and foreign keys. [7 marks]

(iii) When designing a User Interface, you may make use of 'optical illusions'. Briefly explain 3 of them [3 marks]

Question 04

(i) List phases of the classic software life cycle [5 marks]

(ii) Briefly explain what is meant by vulnerability [2 mark]

(iii) List 4 types of threats. [3 marks]

(iv) Write feasible path/s and infeasible path/s in figure 1 [10 marks]

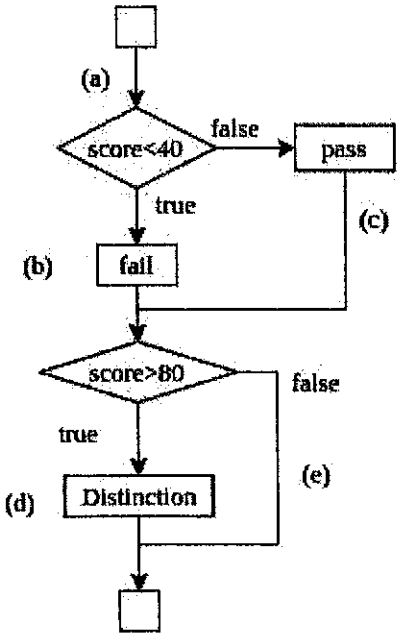


Figure 1