



# THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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**MAIN EXAMINATION**

**JANUARY – APRIL 2019 TRIMESTER**

**FACULTY OF SCIENCE**

**DEPARTMENT OF COMPUTER AND LIBRARY SCIENCE**

**REGULAR PROGRAMME**

**CMT 110: PROGRAMMING METHODOLOGY**

**Date: APRIL 2019**

**Duration: 3 Hours**

**INSTRUCTIONS: Answer Question ONE and any other TWO Questions**  
Questions Q1a, Q3a, 4b & 5c are practical questions and therefore should be done on PC.

**Students MUST ensure all the work done on the PC has been successfully saved in their folders bearing APPROPRIATE student registration and submitted for marking at the end of the exam time**

**The format of naming the folder is “CMT 110-registration number” e.g. CMT110-1000001 if the student registration number is 1000001**

- Q1. a) You have been requested to create a C console based application that meets the following specifications. The application will display the following menu on the console upon starting up the program

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1. Schedule planes
2. Find/Search planes
3. Display
4. Exit

\*\*\*\*\*

Upon a selecting a key from the keyboard, the program should call and execute the appropriate user defined function. If option one is selected, the program should call a function which allows a user to schedule a plane by capturing plane name, registration number, destination, time of departure and date of the departure.

If option two is selected, the program allow the user to key in the three search parameters i.e destination, time of departure and date of departure. The three should be passed to a function which checks if there are any planes matching the three parameters.

If option three is selected, the program display plane name, registration number of the plane matching the above search else the program should display the appropriate error message.

If option four is selected, the program should call the most appropriate function which exits the menu and the program.

The menu should keep on repeating provided the user has selected key 1,2,3 or any other key from the keyboard

Type, debug, test and save the project as Q1 in the folder bearing your registration number. **(16 marks)**

- b) Explain the **TWO** types of errors that can rise from a program **(3 marks)**
- c) You have been provided with the following C program. Identify and explain the nature of syntax errors in the program. Rewrite the new program void of errors identified

```

1. #include <stdio.h>
2. #include <stdlib.h>
3. int main()
4. {
5. int marks;
6. char grade;
7. printf("Enter student marks\n");
8. scanf("%d",&Marks);
9. if(marks>=50 &&<50);
10.{
11.grade='pass';
12.}
13.else
14.{
15.grade="Fail";
16.}
17.printf("You scored %d marks and your grade is %c",marks,grade);
18.return 0;
19.}

```

**(4 marks)**

- d) An employee is paid based on two components i.e. basic pay and overtime hours worked. At the end of the month, a payroll clerk runs a program that prompts the user to enter the number of hours a person has worked and his/her basic pay. The rates for overtime are as follows

Hours	Rate (in Ksh)
0-20	500
Over 20	600

The program is supposed to add the basic pay to overtime pay to get the gross pay of the employee.

The output of the program is the overtimes hours and gross pay

**Required:**

Represent the above information using a flow chart (5 marks)

e) Explain any **TWO** roles of translator programs (2 marks)

Q2. a) Discuss **THREE** categories of programming languages and the nature of application each can be used to create. For each category, name 2 programming languages (6 marks)

b) Explain **THREE** benefits associated with modular programming (3 marks)

c) A program is supposed to capture the basic pay, housing allowance and commuter allowance for a given employee. The three should be added together to get the gross pay of the employ. Based on the gross pay, the program should calculate employee tax as follows

Gross pay	tax ( % of gross pay)
Over 100,000	30
50,000-99,999	25
15,000-49,999	15

The program should subtract tax from gross pay to get the net pay then display gross pay, tax and net pay

**Required:**

Devise a pseudocode for the above business requirement (6 marks)

d) Referencing loops in C, explain the **TWO** major differences between do while and while loop in terms of syntax and structure (2 marks)

e) Rewrite the following program using the **if...else** ifcontrol structure

```

#include <stdio.h>
#include <stdlib.h>
int main()
{
    char x;
    printf("Enter a character form the keyboard\n");
    scanf("%c",&x);
    switch(x)
    {
        case 's':

printf("you typed a character beginning with s");
        break;
        case 'g':
printf("you typed a character beginning with g");
        break;
        default:
printf("invalid entry!");
        break;
    }
    return 0;
}

```

**(3 marks)**

- Q3. a) Write a C program that uses arrays to enable a user to key in information about **n** students i.e. registration number, name, unit code, unit name and marks. The program should then compute the grade and remarks of each student based on the following grading criteria

Marks	Grade	Remarks
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70-100	A	Excellent
60-69	B	Good
50-59	C	Fair
40-49	D	Pass
0-39	F	Fail

The program should then display information of all the **n** students as shown in the following dummy output

#	Registration number	Name	Unit code	Marks	grade
1	1001	Sean	CMT110	80	A
2	1002	Phil	CMT 108	36	F
3	1003	Joe	CMT 107	56	C

(12 marks)

- b) Explain **TWO** major differences between compilers and interpreter in respect to how compilation of the source code is done (4 marks)
- c) Explain the meaning of the following terms as they apply to programming
- i) Debugging (1 mark)
  - ii) Compilation (1 mark)
  - iii) Dry running (1 mark)
  - iv) Object program (1 mark)
- Q4. a) Discuss **TWO** factors a programmer is supposed to consider while selecting a programming language (4 marks)
- b) A program is to be written to generate a water bill of a customer. The program should accept customer meter number, previous reading and current reading of the meter. The current and previous meter reading should be passed to a function known **WaterBill ( )** which calculates the units consumed by subtracting the previous meter from current meter reading.

Based on the units consumed, the function should get the bill of the customer based on the following rates

Units	rate
0-10	100
Over 100	120

The output of the program should be the units consumed, meter number and the bill of the customer.

Type, debug, test and save the project as Q4b in the folder bearing your registration number. **(11 marks)**

- d) Provided with the following identifiers, state whether they are VALID/INVALID. Give an explanation for each of your answer
- i) B.pay **(1 mark)**
  - ii) 1staffname **(1 mark)**
  - iii) Staffname1 **(1 mark)**
  - iv) \_location **(1 mark)**
  - v) Current address **(1 mark)**

Q5. a) The process of developing programs usually follows a number of classical steps known as Program Development Life Cycle (PDLC). Discuss what each of the stages involve **(9 marks)**

b) Explain the output of the following C statements considering the value of a=10, b=7 and c=9

i). `if(a>c && c>b)`  
`{`  
`printf("The largest is 10");`  
`}` **(2 marks)**

ii). `if (b<c && c>a)`  
`{`  
`printf ("Hello, Enjoy programming in C");`  
`}` **(2 marks)**

iii). `while(b>c)`

```
{  
printf ("B is greater than C");  
}
```

**(2 marks)**

- c) Write a C program that calculates the average and sum of all even numbers entered from the keyboard by the user for **n** numbers. The output of the program should be the total even numbers entered from the keyboard, the sum and average **(5 marks)**

Type, debug, test and save the project as 5C in the folder bearing your registration number.

**\*END\***