# The Open University of Sri Lanka
# Faculty of Engineering Technology

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| Study Programme | : | Diploma in Technology (Engineering) |
| Name of the Examination | : | Final Examination |
| **Course Code and Title** | : | **MEK3170 C Programming** |
| Academic Year | : | 2013/2014 |
| Date | : | 01st of September 2014 |
| Time | : | 9.30am – 12.30pm |
| Duration | : | 3 hours |

**General instructions**

1. Read all instructions carefully before answering the questions.
2. This paper consists of 6 questions.
3. Answer four(4) questions including **Question 1.**
4. **Question 1 is compulsory** and carries 40 marks.
5. Answer 3 more questions which carry 20 marks each.
6. This is a **close book** examination.
7. All your programs should have validation codes where ever needed and comments as applicable.

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**Question 1** (Compulsory) **(40 Marks)**

**a)** **[10 Marks]**

Write a complete C/C++ program which will display the following output.

```
*
**
***
****
```

NOTE: Use ***nested loop/s*** to write your program

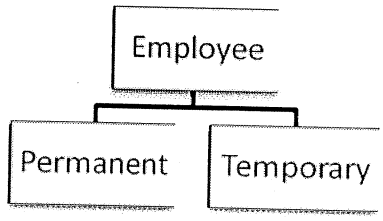
**b)** **[10 Marks]**

Write a complete C/C++ program that will read up to ten letters into an array and write the letters back to the screen in the reverse order. For example, if the input is **abcdefghij**

Then the output should be **jihgfedcba**

c) **[20 Marks]**

Consider the following class hierarchy of Employees at XYZ company, to answer the questions from i to iv.




All Employees have an *ID, name, age* and *Highest qualification.* A Permanent employee has a fixed *monthly salary.* He/She has to necessarily contribute to the *EPF*(Employee Provident Fund) and a *monthly fee* for the sports club, which is deducted from his/her *monthly salary.* A Temporary employee does not contribute to the EPF or to the Sports club and He/She is paid a *daily salary.*
Amali is a Permanent employee and Amara is a Temporary employee assigned to the company.

i. Identify appropriate data members for the base and derived classes according to the description given above.
ii. Declare the base class using C++ coding.
iii. Implementing a function named print_details() in both the derived classes, declare the derived classes using C++ coding. The function must be implemented so that it demonstrates **polymorphism.**
iv. Write C++ coding for the following on the main function
    a. Assuming values for the data members, create an instance (Amali) of the class Permanent employee and assign values to it.
    b. Assuming values for the data members, create an instance (Amara) of the class Temporary employee and assign values to it.
    c. Display the details of Amali and Amara by calling the function print_details() as appropriate.

**Question 2** **(20 Marks)**

Write one complete C/C++ program using **functions** (at least two) for the following tasks.

- To check whether a year is a *leap year* or not
- To return the *number of days* for the month when the user enters the year and the month. You may need to use the function used previously.

  Ex:- If the user enters 2013 and January, the output should be 31 days. But if the user enters 2013 and February, the output should be 28 days. If the user enters 2012 and February, the output should be 29 days as 2012 was a leap year.

**NOTE: Use the following algorithm to find whether a year is a leap year or not**

*start*
*if year is divisible by 400 then*
*year is a leap year*
*else if year is divisible by 100 then*
*year is not a leap year*
*else if year is divisible by 4 then*
*year is a leap year*
*else*
*year is not a leap year*
*stop*

**Question 3** **(20 Marks)**

**a)** **[8 Marks]**

Write a C++/C program including header files using **switch** statements to display the name of the day, when the user enters the number of the day through the keyboard. If the user enters a value less than 1 or greater than 7 then an error message should be displayed.

example :- If the user enters number 1, the program should display "Sunday".

**b)** **[12 Marks]**

Write a C/C++ program including header files to calculate the area of a circle using a function named **calc_Area()**.The function should accept the radius of the circle and return the area to the **main( )** function, where the area of the circle is displayed. Use a **pointer to call the** function **calc_Area()** from the main function.

The formula necessary for the calculation is as follows.

Area = $\pi$ radius $\times$ radius

Please note the following:

- For $\pi$ use the approximated value 3.14159 .
- Do not use <math.h> header file for any form of calculation

**Question 4** **(20 Marks)**

A file is required to maintain the salary of employees at **ABC** Company. The program should allow the user to enter at least three (3) records of new employee data to the file. The file should accept *employee number, employee* name and the *Basic salary* and calculate the *Net Salary* and display it.

The formula required to calculate the *Net Salary* is ***Net Salary = Basic salary + 2500***

Write a complete C++ program for the above given tasks.

**Question 5** **( 20 marks)**

Write a C/C++ program using an array of structures to store information of 10 students using structures. You should create a structure (student) which contains name, group and marks as its data members. Then create an array of structure of 10 elements. You should ask from user the data (name, group and marks) for 10 elements and store them in an array of structure.
Display the data entered by user.

Output of the program should be as follows:-

Enter information of students:

For group number 1
Enter name: Tom
Enter marks: 98

For group number 2
Enter name: Jerry
Enter marks: 89
.

Displaying information of students:

Information for group number 1:
Name: Tom
Marks: 98
.
.

**Question 6**

**(20 Marks)**

Define a class in C++ to represent a bank account. Use constructors and destructors as applicable. Include the following as data members

- Name of the depositor
- Account number
- Type of account
- Balance amount in the account

You are supposed to write member functions for the following tasks.

- To deposit an amount
- To withdraw an amount after checking the balance
- To display name and the balance

You may use the following data given on Table Q6 for the program.

| Name of the depositor | Account number | Type of account | Balance(Rs.) |
|---|---|---|---|
| Nimal | 1010890 | Savings | 150000.00 |
| Kamal | 2020980 | Savings | 60000.00 |
| Sirimal | 3030089 | Savings | 140000.00 |

**Table Q6**

Bank Transactions that needs to program are

- Nimal withdraws an amount of Rs.190000.00 from his account
- Kamal Deposits(Save money) Rs. 3000.00 on his account
- Sirimal Checks his account balance

Write a main program which can be used to test your program.

**END**