

The Open University of Sri Lanka

Faculty of Engineering Technology



Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	: MEK3170 C Programming
Academic Year	: 2014/2015
Date	: 13 th of September 2015
Time	: 9.30am – 12.30pm
Duration	: 3 hours

General instructions

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

Question 1 (Compulsory)

(40 Marks)

a)

[10 Marks]

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

```

1
2 2
3 3 3
4 4 4 4
5 5 5 5 5

```

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

b)

[10 Marks]

Write a complete C/C++ program to print the Array P given and print Array Q which has the square value of each element of the matrix P. Array Q must be defined only by getting the square value of each element of Array P.

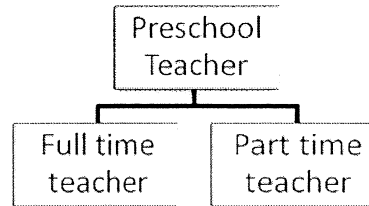
For example, if the input is $P = \{1, 2, 3, 4, 5\}$ then the output should be $Q = \{1, 4, 9, 16, 25\}$.

NOTE :- Do not use <math.h> header file for any form of calculation.

c)

[20 Marks]

Consider the following class hierarchy of preschool teachers of ABC school, to answer the questions from i to iv.



All Preschool teachers have a *teacher ID*, *name*, *age* and *Highest qualification*. A full time teacher 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 part time teacher does not contribute to the EPF or to the Sports club and he/she is paid a *daily salary*. Piyal is a Full time teacher and Amara is a Part time teacher assigned to the school.

- 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 (Piyal) of the class Full time teacher and assign values to it.
 - b. Assuming values for the data members, create an instance (Amara) of the class Part time teacher and assign values to it.
 - c. Display the details of Piyal and Amara by calling the function `print_details()` as appropriate.

Question 2

(20 Marks)

Write a C++ function to calculate the volume of a cube. (Volume = height × width × length)

Assign default parameters only to the width and length.

Call the above function 3 times inside the main method as follows

1. Pass only the height value as 5 (Both default parameters will be called)
2. Pass height value as 5 and width value as 78 (Only one default parameter will be called)
3. Pass all three arguments

Write a separate function which prints the output with a message.

Example of an Output : -
 Volume of the cube:300
 Volume of the cube:780
 Volume of the cube:1520

Question 3**(20 Marks)**

Write a C++ program to create the following menu and execute different functions depending on the user selection.

-----Menu-----

1. Enter Radius and Height of the cylinder.
2. Calculate the Volume of the cylinder.
3. Exit program.

Use a **pointer to call different functions** depending on the option that the user has entered. If the user selects Option no 2 without selecting Option no 1 the user should be prompt with a message asking him/her to select Option no 1 first.

The formula required to calculate the Volume is as follows.

$$\text{Volume} = 3.14 * (\text{Radius} * \text{Radius}) * \text{Height}$$

Question 4**(20 Marks)**

Write one complete C++ program considering the following file operations

1. Read the inputs (*Student ID, Student Name, Online Quiz Marks, Lab Marks and TMA Marks*) from the user and write the data to the file (**data. text**)
2. Calculate and outputs the *Total Marks* of each student. Output (*Student ID, Student Name, Total Marks*) should be appended to the current content of the file. Assume that the file has more than one record on it.

The formula required to calculate the Total Marks is as follows.

$$\text{Total Marks} = \text{Online Quiz Marks} + \text{Lab Marks} + \text{TMA Marks}$$

Question 5**(20 marks)**

Use C++ **array of structures** to maintain details of students at a college. It should contain the **student name, student ID, and student phone number.**

The Class teacher should be provided with the facility to enter details and view the student details whenever necessary.

Question 6**(20 Marks)**

'GoldenSW' swimming club has many Permanent and Non permanent members registered with it. All members need to pay the Monthly payment at the end of each month. The monthly payment is calculated as follows.

- For Permanent Members:-
Monthly Payment = Rate per hour * No of Hours
- For Non Permanent Members:-
Monthly Payment = Rate per hour * No of Hours + Rs.1000

Write a complete C++ program using the Object oriented concepts to calculate the Monthly Payment for the 4 members whose information is given in Table Q6.

Please note the following: You should use base classes, derived classes, constructors, destructors, functions and other object oriented concepts to develop the program.

Member Name	Member Type	No of Hours	Rate per hour
Olu	Permanent Member	10	Rs.300
Nelum	Non Permanent Member	5	Rs.500
Araliya	Permanent Member	12	Rs.300
Rose	Non Permanent Member	7	Rs.500

Table for Q6

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