

UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

MAIN EXAMINATION: 2015

TITLE OF PAPER: PROGRAMMING TECHNIQUES I

COURSE NUMBER: EE271

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

ANSWER ALL FIVE (5) QUESTIONS.

MARKS FOR DIFFERENT SECTIONS ARE SHOWN ENCLOSED IN SQUARE BRACKETS.

THIS PAPER HAS SEVEN (7) PAGES INCLUDING THIS PAGE.

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QUESTION 1 (10 Marks)

Choose the correct letter for the answer in each of the following options. Each correct answer or choice carries [1] mark.

1.1 Memory unit is one part of

- A. Input device
- B. Control unit
- C. Output device
- D. Central Processing Unit

1.2 The loop in which the statements within the loop are executed at least once is called:

- A. do-while
- B. while
- C. for
- D. goto

1.3 The statement which is used to terminate the control from the loop is:

- A. exit
- B. break
- C. continue
- D. goto

1.4 Which amongst the following is not a keyword?

- A. float
- B. external
- C. int
- D. double

1.5 Which of the following number system/code uses only 0s and 1s

- A. decimal
- B. octal
- C. hexadecimal
- D. none of the above

1.6 Which of the following is FALSE in C.

- A. Keywords can be used as variable names
- B. Variable names can contain a digit

- C. Capital letters can be used in variable names
- D. Variable names do not contain a blank space

1.7 Each C preprocessor directive begins with

- A. #
- B. include
- C. main ()
- D. {

1.8 The C language includes the header file standard input & output in

- A. stdlib.h library
- B. stdio.h library
- C. conio.h library
- D. #include library

1.9 A variable which is visible only in the function in which it is defined, is called

- A. static variable
- B. auto variable
- C. external variable
- D. local variable

1.10 The function fprintf is used in a program

- A. When too many printf calls have been already used in the program
- B. In place of printf, since printf uses more memory
- C. When the output is to be printed on to a file
- D. When the type of variables to be printed are not known before

QUESTION 2 (15 Marks)

a) What is the output of the following program fragment

```
int x = 5;  
int y = x++;  
printf("%d%d", x, y);
```

[2]

b) What is the output of the following program segment?

```
main ( )
```

```

{ float a = 0.5, b = 0.7;
  if (b < 0.8)
    if (a < 0.5) printf ("ABCD");
    else printf ("PQR");
  else printf ("JKLF");
}

```

[2]

c) What is the output of the following program segment?

```

main()
{
int i = 1;
do
  { printf("%d..", i);
  }
while(i--);
}

```

[2]

d) What will be the output of following program?

```

main()
{
int x=15;
printf("\n%d%d%d", x!=15, x=20, x<30);
}

```

[3]

e) Describe the output of the following C program fragment

```

void main ()
{ int k = 0, x = 0;
  while (k < 25)
  { if (k % 5 == 0)
    { x += k;
      printf("%d ", x);
    }
    ++k;
  }
  printf("\nx=%d ", x +k);
}

```

[6]

QUESTION 3 (25 Marks)

- a) Write a switch statement that will examine the value of an integer variable and print the following messages:
It is hot weather; if the integer value is 1
It is a stormy weather; if the integer value is 2
It is sticky weather; if the integer value is 3
It is a pleasant weather; otherwise [6]
- b) Design an algorithm that accepts a positive integer and reverses the order of its digits [5]
- c) While purchasing certain items, a discount of 10% is offered if the quantity purchased is more than 1000. If the quantity and price per item are input through keyboard, write a program to calculate the total expenses. [7]
- d) Write a function, which takes an array of real numbers and its size as arguments and returns the maximum. Using the above function write a program to read a set of real numbers from the keyboard and find the maximum number in the array. [7]

QUESTION 4 (25 Marks)

A small airline has just purchased a computer for its new automated reservations system. The president has asked you to program the new system. You are to write a program to assign seats on each flight of the airline's only plane (capacity: 10 seats).

Your program should display the following menu of alternatives:

Please type 1 for "first class"
Please type 2 for "economy"

If the person types 1, then your program should assign a seat in the first class section (seats 1-5).
If the person types 2, then your program should assign a seat in the economy section (seats 6-10).

Your program should then print a boarding pass indicating the person's seat number and whether it is in the first class or economy section of the plane.

Use a single-subscripted array to represent the seating chart of the plane. Initialize all the elements of the array to 0 to indicate that all seats are empty. As each seat is assigned, set the corresponding elements of the array to 1 to indicate that the seat is no longer available.

Your program should, of course, never assign a seat that has already been assigned. When the first class section is full, your program should ask the person if it is acceptable to be placed in the economy section (and vice versa). If yes, then make the appropriate seat assignment. If no, then print the message "Next flight leaves in 3 hours."

Your program will be graded according to the following criteria:

- i) Correctness – does the program produce the desired result. [18]
- ii) Clarity – proper indentation of program makes it easy to read. [2]
- iii) Sensible naming of variables – makes it easy to understand code when debugging. [3]
- iv) Proper use of comments – comments also make the program easy to understand. [2]

QUESTION 5 (25 Marks)

- a) Convert the following code to use a "do-while" loop instead of for loop. [5]

```
#include <stdio.h>

int main (void)
{
    int i;

    for (i=25; i >=0; i--)
        printf("%c", 'z'-i);

    printf("\n");

    return 0;
}
```

- b) Write a complete C program that uses a **recursive function** named *Power*. The program should prompt the user to enter the base and the exponent values as integers, and then display the output computed by the function *Power*. The recursive function *Power*(*base*, *exponent*) when invoked returns

$$\text{base}^{\text{exponent}}$$

For example, $\text{Power}(5, 4) = 5 * 5 * 5 * 5$. Assume that exponent is an integer greater than or equal to 1. *Hint*: The recursion step would use the relationship

$$\text{base}^{\text{exponent}} = \text{base} * \text{base}^{\text{exponent} - 1}$$

and the terminating condition occurs when exponent is equal to 1 because

$$\text{base}^1 = \text{base}$$

Note: You do not need to include comments in your program

[20]