



**PROGRAM** : BACHELOR OF ENGINEERING TECHNOLOGY:  
*ELECTRICAL*

**SUBJECT** : **Algorithms/Programming 1A**

**CODE** : **ALGELA1**

**DATE** : JULY 2019 (SUPPLEMENTARY EXAM)

**DURATION** : 180 min

**WEIGHT** : 40:60

**TOTAL MARKS** : 100 out of 105 Possible Marks

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**EXAMINER** : DR. CHABALALA CHABALALA

**MODERATOR** : DR. AHMED ALI

**NUMBER OF PAGES** : 4 PAGES

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**INSTRUCTIONS** : CALCULATORS ARE PERMITTED (ONLY ONE PER STUDENT)

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**INSTRUCTIONS TO CANDIDATES:**

1. ANSWER ALL THE QUESTIONS,
2. WRITING IS DONE IN PEN ONLY,
3. KEEP ANSWERS TO THE SPACE PROVIDED,
4. DO NOT COMBINE ANSWERS TO DIFFERENT SUB-SECTIONS OF QUESTIONS,
5. YOU WILL BE GIVEN 3 HOURS TO COMPLETE THE EXAMINATION.
6. **THERE ARE 6 QUESTIONS FOR 105 MARKS, 100 MARKS FOR 100%.**
7. **THE QUESTION PAPER SHOULD RETURN WITH THE ANSWER SHEET.**

## Question 1

[10 Marks]

Mark as **TRUE/FALSE**. If the answer is false, briefly explain why.

- a) In C programming, comments cause the computer to display the text after the `//` on the screen when the program is executed. [2 Marks]
- b) Two pointers that point to different arrays cannot be compared meaningfully. [2 Marks]
- c) In C programming, it's an error if an initializer list contains more initializers than there are elements in the array. [2 Marks]
- d) The `break` statement is required in the default case of a switch selection statement. [2 Marks]
- e) The expression `(x>y && a<b)` is true if either `x > y` is true or `a < b` is true. [2 Marks]

## Question 2

[20 Marks]

- a) Define an array of type unsigned int called `values` with five elements, and initialize the elements to the even integers from 2 to 10. Assume the symbolic constant **SIZE** has been defined as 5. [4 Marks]
- b) Define a pointer **vPtr** that points to an object of type unsigned int. [2 Marks]
- c) Print the elements of array values using array subscript notation. Use a **for()** statement and assume integer control variable `i` has been defined. [4 Marks]
- d) Give two separate statements that assign the starting address of the array values to the pointer variable **vPtr**. [4 Marks]
- e) Print the elements of array values using pointer/offset notation. [4 Marks]
- f) Refer to element 5 of array values using array subscript notation. [2 Marks]

## Question 3

[20 Marks]

- a) Write a program that has a function **TimeInSeconds()** that takes the time as three integer arguments (for hours, minutes, and seconds) and returns the number of seconds since the last time the clock "struck **23h59**." [8 Marks]
- b) Develop a function **TimeDifference()** using the above function **TimeInSeconds()** to calculate the amount of time in seconds between two times, both of which are expressed within one 24-hour cycle of the clock. [8 Marks]
- c) Write the main program to illustrate how the program works. [4 Marks]

## Question 4

[20 Marks]

- a) Write a pseudocode algorithm for the following: a program that requests two numbers from the keyboard, compute their sum and display the result on the screen. [4 Marks]
- b) Write a C program to implement the algorithm you developed in (a) above. [6 Marks]
- c) What does the following program do? Briefly describe. What will be the result of the program for the following inputs: 119 and 9? [10 Marks]

```
1  #include <stdio.h>
2
3  int mystery(int a, int b );
4
5  int main( void ) {
6      int x; // first integer
7      int y; // second integer
8
9      printf( "%s", "Enter two positive integers: " );
10     scanf( "%u%u", &x, &y );
11
12     printf( "The result is %u\n", mystery( x, y ) );
13 }
14
15 // Parameter b must be a positive integer
16 int mystery(int a, int b ) {
17
18     if ( 1 == b ) {
19         return a;
20     } // end if
21
22     else {
23         return a + mystery( a, b - 1 );
24     }
25 }
```

## Question 5

[15 Marks]

- a) Write a program that prints the shape of a diamond. Your program must request the height of the diamond as input from the user. The height is defined by the number of asterisks. You may use **printf** statements that print either a single asterisk (\*) or a blank. Maximize your use of repetition and minimize the number of **printf** statements. [15 Marks]

```

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

## Question 6

[20 Marks]

Find the error in each of the following program segments. If the error can be corrected, briefly illustrate how you can carry out the corrections. [20 Marks]

d)

```
1  int *number;
2  printf( "%d\n", *number );
```

e)

```
1  float *realPtr;
2  long *integerPtr;
3  integerPtr = realPtr;
```

f)

```
1  int * x, y;
2  x = y;
```

g)

```
1  float x = 19.34;
2  float xPtr = &x;
3  printf( "%f\n", xPtr );
```

e)

```
1  void f( float a ); {
2      float a;
3      printf( "%f", a );
4  }
```

f)

```
1  int b[ 10 ] = { 0 }, i;
2  for ( i = 0; i <= 10; ++i ) {
3      b[ i ] = 1;
4  }
```

g)

```
1  int g( void ) {
2      printf( "%s", Inside function g\n" );
3      int h( void ) {
4          printf( "%s", Inside function h\n" );
5      }
6  }
```