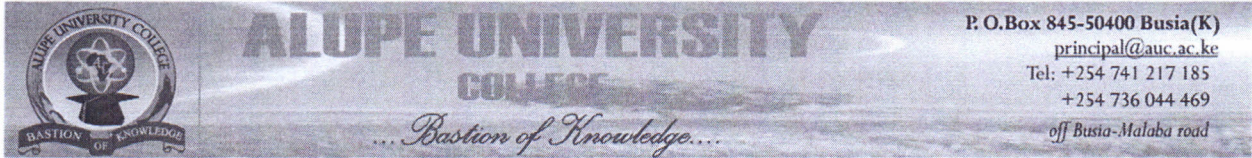


COM 213



**OFFICE OF THE DEPUTY PRINCIPAL  
ACADEMICS, STUDENT AFFAIRS AND RESEARCH**

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**UNIVERSITY EXAMINATIONS**

**2020 /2021 ACADEMIC YEAR**

**SECOND YEAR FIRST SEMESTER REGULAR EXAMINATION**

**FOR THE DEGREE OF BACHELOR OF SCIENCE (COMPUTER SCIENCE)**

**COURSE CODE: COM 213**

**COURSE TITLE: PROCEDURAL PROGRAMMING**

**DATE: 15/03/2021**

**TIME: 0900 – 1200 HRS**

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**INSTRUCTION TO CANDIDATES**

- **SEE INSIDE**

**THIS PAPER CONSISTS OF 7 PRINTED PAGES**

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# COM 213

## REGULAR EXAM

### COM 213: PROCEDURAL PROGRAMMING

STREAM: COM

DURATION: 3 Hours

#### INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

#### SECTION A [24 Marks]. Answer **ALL** questions.

##### QUESTION ONE [12 MARKS]

- a. Define the following terms as used in C++ Programming. [2 Marks]
- Namespace
  - Library
- b. With illustration, explain why programmers use comments in a program. [2 Marks]
- c. What will be the exact output of line 2 in the code segment below? [2 Marks]
- d. Distinguish between **Array**, **Structure** and **Union** with C++ code segment [6 marks]

```
1 int r = 10;
2 int p= a++ +11;
3 cout<<"r = "<<r<<"p = "<<p<<endl;
```

##### QUESTION TWO [12 MARKS]

Consider a digital calendar that displays the day, month and year. The calendar updates at midnight every day to display the correct day, month and year.

- If the current day is not the last day of the month, then the day is simply incremented by 1.
- If the current day is the last day of the month, and the month is not the last month of the year, then the new date is (the 1<sup>st</sup>) of the next month of the same year.
- If current day is the last day of the last month of the year, then the new date is 1 (1<sup>st</sup>) of the first month of the next year.
- The calendar also accounts for leap year. A leap year is a year that is divisible by both 400 and 100 or just divisible by 4. If a year is a leap year, then the last day of the second month is 29, else it is 28.
- Day in a month are {31, 28/29, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31} for January to December respectively.

Given the following first five lines:

```
1 # include <iostream>
2 using namespace std;
3 int day;
4 int year
5 int days [12]= {31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31};
```

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- a. Write a function definition named **leap** that returns **true** if the year entered is a leap year, otherwise it returns **false**. [2 Marks]
- b. Write a function definition named **endMonth** that returns **true** if the day entered is the last day of the month, otherwise it returns **false**. [2 Marks]
- c. Write a function definition named **checkDay** such that it checks the day entered against the days of the month and returns the day if it is **valid** day, otherwise it returns **-1**. [2Marks]
- d. Write the definition of a function named **increment** that correctly calculates the date of the next day. [2 Marks]
- e. Write the body of the C++ program (main function) that uses the function in (iii) to check if the date is valid. If the **date is valid** it displays the current date and uses the function in (iv) to increment the date and display new date. If the date input is invalid, it displays **invalid date**. [4 Marks]

### Example 1 (Input Underlined)

```
Enter day : 12  
Enter Month: 5  
Enter Year : 2000
```

```
Current Date is 12-5-2000  
Next Date is 13-5-2000
```

### Example 2 (Input Underlined)

```
Enter day : 28  
Enter Month: 2  
Enter Year : 2001
```

```
Current Date is 28-2-2001  
Next Date is 1-3-2001
```

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### Example 3 (Input Underlined)

```
Enter day : 29  
Enter Month: 2  
Enter Year : 2001
```

Invalid Date.

### Example 4 (Input Underlined)

```
Enter day : 31  
Enter Month: 6  
Enter Year : 2014
```

Invalid Date.

## SECTION B [36 MARKS] ANSWER ANY THREE QUESTIONS]

### QUESTION THREE [12 MARKS]

- Explain **function prototyping**, **function definition** and **function calling** using a suitable C++ examples. [6 Marks]
- Using a loop construct of your choice, write a code excerpt that will give the output below. [6 Marks]

```
0 1 2 3 4 5  
0 1 2 3 4 5  
  1 2 3 4 5  
    2 3 4 5  
      3 4 5  
        4 5  
          5
```

### QUESTION FOUR [12 MARKS]

- The  $n^{\text{th}}$  number in Fibonacci sequence is given by

$$F_n = F_{n-1} + F_{n-2} \quad \text{for} \quad F_0=0 \text{ and } F_1=1$$

Write a program that reads a positive integer N from the keyboard and display the N Fibonacci Numbers.

[4Marks]

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- b. The marks obtained by a student in 5 different subjects are input through the keyboard. The student is award a division as per the following rule.

Mean Percentage (%)	Division
Above or equal to 70	First Class Honors
Between 60 and less than 70	Second Class Upper division
Between 50 and less than 60	Second Class Lower division
Between 40 and less than 50	Pass
Between 0 and less than 40	Fail

Write a C++ program to calculate the division obtained by the student. [6 Marks]

- c. Assume the marks entered in **part (c)** above forms an array of scores, write a C++ program that arranges the scores obtained by the student in each subject in ascending order. Write an algorithm that will be used print the sorted scores, highest and the least scores obtained by the student. [2 Marks]

### QUESTION FIVE [12 MARKS]

- a. Explain what the #include <iostream.h> does for a C++ program. [2 Marks]

- b. Consider the code segment below

```
int i=1;
  while(i<=10)
  {
  if(i<8 && i !=2 || i%4 !=0)
  cout<<i--;
  break;
  }
  I++;
```

What would be the output of the above code be? [1 Marks]

- c. Explain the concept of divide\_and\_conquer or step\_wise refinement as use in the study of procedural programming. [2 Marks]
- d. What is a recursive function? Write a recursive function that calculates factorial of a non-negative integer (N) it receives. [4 Marks]
- e. Assume the existence of the following function definitions.

<pre>int sumOf(int x, int y) { return x+y; }</pre>	<pre>int timesTwo(int x ) { return 2*x; }</pre>	<pre>int halfOf(int x) { return x/2; }</pre>
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What is the value in variable x after the following code has executed?

```
int m = 12;
int n = 21;
int x = halfOf(timesTwo(sumOf(sumOf(2,timesTwo(n)),halfOf(m))) +
3*n);
```

Show how you arrived at your answer.

[3 Marks]

**QUESTION SIX [12 MARKS]**

a. The following matrix represents the scores of 4 students (rows) in 5 tests (columns).

80	45	59	63	40
9	72	63	48	50
69	70	81	63	50
62	72	59	61	70

Initialize the above scores into a two-dimensional array called studentMarks.

[2 Marks]

b. In a class, there are 10 students each taking 5 subjects:

- i. Write a function that will receive a one dimensional array for marks of each student, calculate and return the sum. [2 Marks]
- ii. Write a function that will receive a one dimensional array for marks of each student, calculate and return the average for the student. [3 Marks]
- iii. Write the main function to receive each student's marks from the keyboard and populate an array before calling the functions defined in (i) for sum and (ii) for average. Write each student marks, sum and average to a file named marks.docx. Sample file output is shown in Table 1.

Table 1: Sample Output in File – showing 2 students out of 10

NAME	COM1	COM2	COM2	COM3	COM4	TOTAL	MEAN
Akinyi Ebenezer	80	78	90	75	65	388	77.8
Muyobo Allans	90	70	81	67	91	399	79.8

[5 Marks]

**QUESTION SEVEN [12 MARKS]**

- a. The formula for computing the area of a cone is  $\pi * r + (r + \sqrt{(r^2 + h^2)})$  where r is the base radius of the cone, h is the height of the cone and  $\pi$  is a constant with value 3.1428. Using double pow(double,double) or double sqrt(double) function of **math.h** library, write a function that will receive height and radius of a cone and return the surface area of the cone. [5 Marks]
- b. Write a function called computeIncentive that takes one argument salesamt compute and returns the annual incentives based on sales amount. [4 Marks]

**Table 2: Incentive Table**

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Class	Sales	Incentives
1	0 to 10000	10% of sales amount
2	10001 to 20000	20% of sales amount
3	20001 to 30000	25% of sales amount.

c. Discuss the components of `<fstream>` and `<iostream>` as used in file I/O in C++ [3 Marks]

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