



**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

**(A Constituent College of JKUAT)**

(A Centre of Excellence)

# **Faculty of Engineering & Technology**

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

**UNIVERSITY EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE  
IN INFORMATION TECHNOLOGY (BSC IT M11)**

**ICS 2305: SYSTEMS PROGRAMMING**

END OF SEMESTER EXAMINATION

**SERIES: AUGUST 2012**

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

---

**SECTION A (COMPULSORY)**

**Question One (30 Marks)**

- a) (i) Define the term system programming.  
(ii) Briefly explain the term system software and outline **THREE** types of system software. **(4 marks)**
- b) (i) As a system programmer justify the phrase.  
“An operating system is all the code that you did not have to write”  
(ii) Briefly describe the **THREE** design objectives that any operating system tries to achieve **(10 marks)**
- c) Distinguish between a distributed operating system and a parallel operating system. **(4 marks)**
- d) Outline the term that each of the following acronyms stand for as used in the operating systems.

- i) TLB
- ii) PCB
- iii) POSIX
- iv) HAL

(4 marks)

- e) What is the objective of the FREE software foundation? As you outline, elaborate on the concept of copy left with reference to free software. (4 marks)
- f) What is a privileged instruction? In your own perspective, outline **THREE** areas that privileged instructions are important. (4 marks)

### **SECTION B (Answer Any Two Questions)**

#### **Question Two (20 marks)**

- a) The phrase “The operating system provides an interface between the hardware and user applications defines the term operating system. In your own view how different does that operating system interface either the hardware or user applications? (4 marks)
- b) (i) Define the term event.  
 (ii) As you explain in (i) above, distinguish between the three types of events trap system call and interrupt. (7 marks)
- c) Briefly describe how the file system module is crucial when it comes to access to persistent storage. (3 marks)
- d) What is a device driver? Why is it important to an operating system? (3 marks)
- e) How is the accounting module important in an operating system with respect to user application? (3 marks)

#### **Question Three (20 marks)**

- a) (i) Differentiate between symbolic link and hard link.  
 (ii) When we create a file using the touch command, what are the default file permissions for the file? Is the file executable? If yes explain, otherwise give the command to only make the owner execute the file.

(iii) The following is the file permissions for the file called xprint.

`-r—r—r-x..... print...`

It is expected to be executed by both the owner and the group. Outline the command that can be used for that to happen. (10 marks)

- b) (i) What file system does Linux use? Outline.  
 (ii) Linux attach a lot of meaning to its directories after installation. Outline **THREE** directories that are created by default on installation and describes the importance of each on Linux operating system. (7 marks)
- c) What is a shell? As you define, give **FOUR** examples of a shell environment in Linux (3 marks)

#### **Question Four (20 marks)**

- a) (i) What is a thread? What is the objective of threads in an operating system?  
 (ii) Differentiate between the two types of threads; POS IX and WIN-32 threads.  
 (iii) Outline the **FOUR** approaches for passing multiple arguments to a thread. (11 marks)

b) Consider the following procedure, written on C:

```

     $\theta$ 
Unsigned int count =
Const int iterations = 1000 000 000;
Unsigned int incur (void) {
    Int i;
     $\tau = \theta$ 
    For ((i) i < iterations; I ++ )
        Count ++;
    Return count;
}

```

- i) Suppose incr is executed concurrently by ten threads, all sharing the global variable count. Each thread calls incr, then prints the value returned.
- ii) If the execution of threads is not time-sliced, what values should be printed by each thread?
- iii) Can you characterize the values printed if thread execution is time-sliced? **(9 marks)**

**Question Five (20 marks)**

- a) Outline the **FIVE** common codes that are used to depict the current status of a process. **(5 marks)**
- b) With the aid of an example, briefly discuss the concept of apparent and child process in view of a Linux operating system. **(6 marks)**
- c) What does the concept of a prime ancestor mean to a Linux operating system? **(4 marks)**
- d) Explain the function for each of the following system routines in Linux.
  - i) Fork ()
  - ii) Kill ()
  - iii) Sleep ()
  - iv) Excel ()
  - v) Waitpid () **(5 marks)**