CHUKA UNIVERSITY

FOURTH YEAR EXAMINATION FOR THE AWARD OF BACHELOR OF COMPUTER SCIENCE

COSC 428: OPERATING SYSTEMS DESIGN

INSTRUCTIONS:

Answer question One in SECTION A and ANY other two questions in SECTION B.

QUESTION ONE: 30 MARKS

a) Describe the following terms: (6 marks)

   i. System call.

   ii. Programming API.

   iii. Communication Protocol.

b) What is runtime environment (RTE)? Give two examples. (3 marks)

c) Outline four functions of run time environment. (4 marks)

d) The OS manages the life cycle of a process generally there in 3 main steps: Creating, managing and terminating the process. Explain the step by step details and interaction that take place. (6 marks)

e) In context of process execution explain what is meant by system call and context switch and provide examples. (5 marks)

f) Discuss three reasons for use of multithreading systems. (6 marks)

Attempt ANY two questions: 40 marks

QUESTION TWO (20 MARKS)

a) Define the following terms: (6 marks)

i) Device controller.

ii) Device interface.

iii) Buffered IO.

b) Using a diagram explain how the DMA controller operates. (4 marks)

c) Describe the differences among short-term, medium-term, and long-term scheduling.

(6 marks)

d) With aid of a diagram differentiate between local and remote procedure call.

(4 marks)

QUESTION THREE (20 MARKS)

a) What are the four major activities of an operating system with regard *to* file management? (4 marks)

b) Differentiate between the two figures given below and in each of them explain what happens and advantage of fig over fig 2. (6 marks)

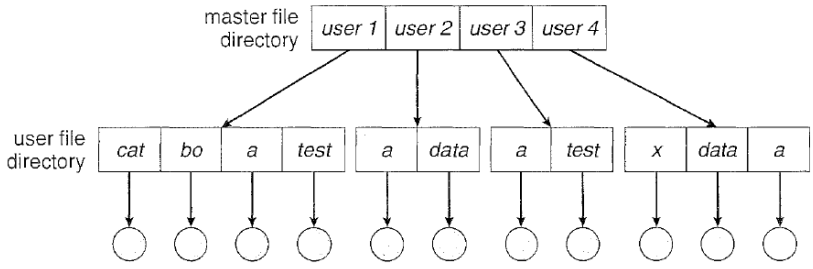

Fig 1.

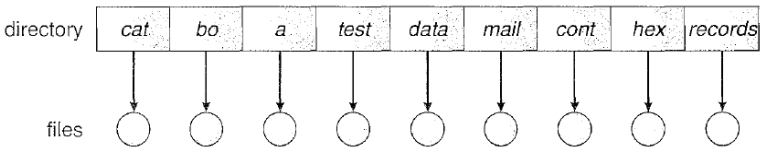

Fig 2.

c) Differentiate between the following: (6 marks)

i) Contiguous and linked allocation.

ii) File attribute and file operation mode.

d) Describe the differences between symmetric and asymmetric multi-processing. What are three advantages and one disadvantage of multiprocessor systems? (4 marks)

QUESTION FOUR (20 MARKS)

a) Differentiate between the following: (12 marks)

i) Signal and semaphores

ii) Pipe and file

iii) Process and thread.

b) Race conditions are possible in many computer systems. Consider a banking system with two functions: deposit (amount) and withdraw (amount). These two functions are passed the amount that is to be deposited or withdrawn from a bank account. Assume a shared bank account exists between a husband and wife and concurrently the husband calls the withdraw() function and the wife calls deposit(). Describe how a race condition is possible and what might be done to prevent the race condition from occurring.

(4 marks)

c) Discuss any two techniques which can be applied to address processor IO speed difference. (4 marks)

QUESTION FIVE (20 MARKS)

a) The code below is a date server explain line; 1,2, 3, 6, 7, 10, 14,16,18,21, 22 and 23 of the code and what each part identified represents. (8 marks)

```
1   import java.net.*;

2   import java.io. *;

3    public classes DateServer
4   {
5   }
6   public static void main (String [] args) {
7   try {
8    }
9    }
10   ServerSocket sock= new ServerSocket (6013);
11   II now listen for connections
12   while (true) {
13   }
14   Socket client= sock.accept();
15   PrintWriter pout = new
16   PrintWriter(client.getOutputStream(), true);
17   II write the Date to the socket
18    pout.println(new java.util.Date().toString());
19   II close the socket and resume
20   II listening for connections
21   clients. close() ;
22   catch (IOException ioe) {
23   System.err.println(ioe);
          }
```

b) Differentiate between connection oriented communication and connectionless communication. (4 marks)

c) Explain each of the following terms as applied to systems programming using JAVA language: (8marks)

i) public

ii) protected

iii) default

iv) private