



Kirinyaga University

UNIVERSITY EXAMINATION 2018/2019

YEAR III SUPPLEMENTARY/SPECIAL EXAMINATION FOR THE DEGREE
OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

ICS 2305- Systems Programming Year Iii 2019

Date: Monday, 8th July 2019

Time: 8.30am – 10.30am

INSTRUCTIONS

*Answer Question One and any other **two** questions*

Question One-Compulsory-30 Marks

- a) By giving an example explain what is system programming (3 Marks)
- b) In comparison with other operating system explain four features of Unix that makes it ideal for programmers and system developers (4 Marks)
- c) Explain the following terms in context of system programming (4 Marks)
 - (i) File stream
 - (ii) Buffer
 - (iii) Zombie Process
 - (iv) Garbage collection
- d) Identify any four records of the process table (2 Marks)
- e) Explain the three ways that a hardware can be programmed to perform I/O (3 Marks)
- f) UNIX uses a logical structure called *i-node* to store the information about a file on disk - each file in a filesystem is represented by an *i-node*, which contains information about the file, explain four such information. (4 Marks)
- g) Differentiate between memory corruption and memory leak (2 Marks)
- h) Explain the two general classes of I/O devices. (4 Marks)
- i) Compare the regular and special files in a filing system. (4 Marks)

Question Two-20 Marks

- a) Describe the meaning of the following system Calls as used in file management. (4 Marks)

- (i) `n=read(fd, buffer, nbytes)`
- (ii) `n=write(fd, buffer, nbytes)`
- (iii) `position=lseek(fd, offset, whence)`
- (iv) `s=Stat(name, &buf)`

b) Consider the incomplete C code below:

```
...
int fd1, fd2, fd3;
...
dup2( fd3, 2);
```

- (i) Explain what the `dup2()` call accomplishes exactly in the above program. Assume that `fd3` is currently valid/open. (4 Marks)
 - (ii) Where will the output written by the above program be stored after the `dup2()` call? Explain. (4 Marks)
- c) Using two different examples bring out the difference between the user perspective and the operating system perspective of a process. (8 Marks)

Question Three-20 Marks

- a) Explain the unique role of Sockets as opposed to Pipe in Inter Process Communication (4 Marks)
- b) Differentiate named from unnamed pipes (6 Marks)
- c) The following is a code segment from a program that implements sockets in C programming. Study the program and explain its main parts using comments (6 Marks)

```
unsigned long promptForINETAddress()
{
    char hostName[1001];
    unsigned long inetAddress;
    do
    {
        printf("Host name( q=quit, s=self) :");
        scanf("%s", hostName);
        if ( strcmp(hostName,"q") == 0 ) return (0);
        inetAddress =nameToAddr("HostName not found \n");
    } while ( inetAddress == 0 );
}
```

d) Identify and explain the four fields of Internet socket address structure (4 Marks)

Question Four-20 Marks

a) Explain the meaning of the term memory management and discuss why it is a necessary part of computer programming. (4 Marks)

b) Explain the use of the following functions in memory management (6 Marks)

(i) void *malloc(size_t size);

(ii) void free(void *ptr);

(iii) void *realloc(void *ptr, size_t size);

c) The following program has problems with potential to cause memory corruption.

Identify any three such cases and explain how (6 Marks)

```
#include <stdio.h>
#include <stdlib.h>
int main(int argc, char **argv)
{
    int a[21];
    int *b = malloc(2*sizeof(int)), *c;
    a[2] = 5;
    a[0] += 2;
    c = b+3;
    free(&a[0]);//
    free(b);
    free (b)
    b[0]= 5;
    return 0;
}
```

d) Evaluate the two programs below and differentiate between counter in the first program and x in the second in the context of memory allocation and life span

(4 Marks)

First Program	Second Program
<pre>int counter=0; int main(int argc, char **argv) { Counter++; return 0; }</pre>	<pre>int foo(int a) { int x = a + 1; // local var return x; } int main(int argc, char **argv) { int y = foo(10); // local var return 0; }</pre>