

KIRINYAGA UNIVERSITY
University Examinations 2022/2023
SCHOOL OF PURE AND APPLIED SCIENCES
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
COMPUTER SCIENCE / SOFTWARE ENGINEERING
SPC 2307 Systems Programming
MAIN PAPER

DATE: DECEMBER 2022

TIME: 2HOURS

Instructions: Answer Question ONE and Any Other Two.

QUESTION ONE (30 MARKS)

- a) Discuss
- (i) The sequence of activities/ different tests performed by the **P.O.S.T** (3 marks)
 - (ii) The correct order/sequence in which BIOS tests are executed. (2 marks)
- b) The following code sequence is not absolute and can change depending on the manufacturer of the computer. Elaborate the function of this code segment (2 marks)

```
FUNCTION MakeWord& (ANum AS INTEGER)  
IF ANum < 0 THEN  
    MakeWord = 65536& + ANum  
ELSE  
    MakeWord = ANum  
END IF  
END FUNCTION
```

- c) The status of the file that is retrieved and placed in the **buf** has much information about the file. Complete the table below (5 marks)

Information store	Description
<i>e.g st_atime</i>	<i>Last access time</i>
st_mtime	
st_ctime	
st_size	
st_uid	
st_mode	

- d) When using C functions and system calls *malloc* is used.
- i. Explain its use on system calls (1 ½ marks)
 - ii. Write a simple statement using *malloc* (1 ½ marks)
- e) Describe the system call that it supported below and what is expected output.(4 marks)

```

#include <stdio.h>

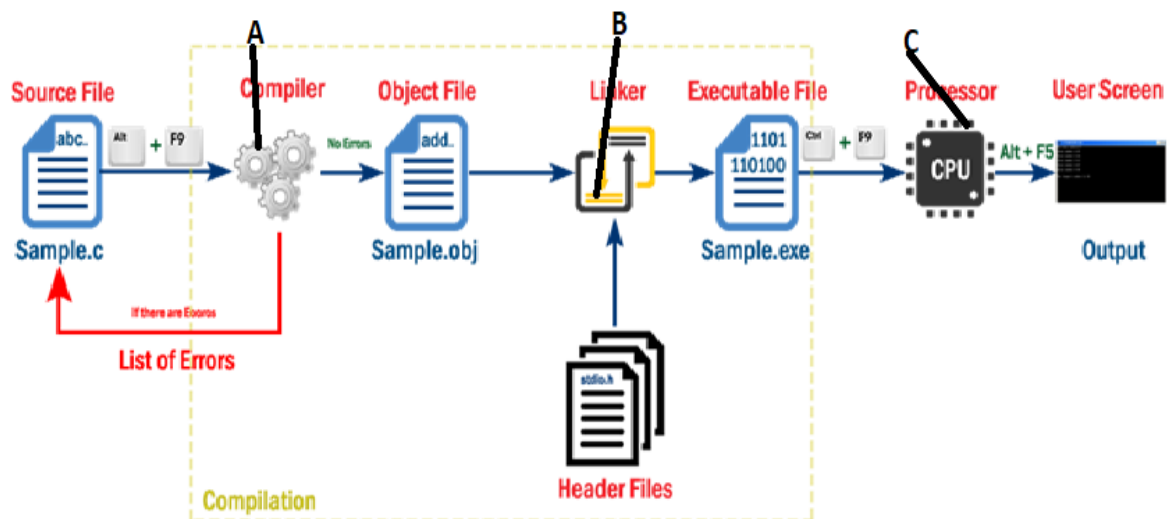
int main()
{
    char name(50);    int marks, i, num;
    printf("Enter number of students: ");
    scanf("%d", &num);
    FILE *fptr;
    fptr = (fopen("C:\\student.txt", "w"));
    if(fptr == NULL)
    {
        printf("Error!");
        exit(1);
    }
    for(i = 0; i < num; ++i)
    {
        printf("For student%d\nEnter name: ", i+1);
        scanf("%s", name);
        printf("Enter marks: ");
        scanf("%d", &marks);
        fprintf(fptr, "\nName: %s \nMarks=%d \n", name, marks);
    }    fclose(fptr);
}

```

- f) Using a block diagram in a hierarchy, represent the following items together with their relationships(*System call interface, applications, network driver stack, system bus*)(4 marks)
- g) Distinguish between the following pairs
- i. Interpreter and Compiler (2 mark)
 - ii. Systems and applications programming (2mark)
- h) Discuss the general stages followed when developing a computer program (3 marks)

QUESTION TWO (20 MARKS)

- a) Distinguish between system calls and inter-process communication (2 mark)
- b) Explain the two general classes of I/O devices. (2 marks)
- c) Explain what is a socket in reference to Unix OS and describe the programmers view of a socket (4 marks)
- d) Study the diagram below and expound on what is happening in the following (**A-B-C**)steps respectively (6 marks)



e) Study the following code segment and answer the questions that follows

```
#include <stdio.h>
#include <stdlib.h>
main ()
{
    char *q = NULL;
    printf("..... \nGoodbye\n");
    q = (char *)malloc(strlen("Goodbye")+1);
    printf("About to ..... \nGoodbye\n" to q at address %u\n",
    q);
    strcpy(q, "Goodbye");
    printf("String ..... \n");
    printf("%s\n", q);
}
```

- i. Discuss the purpose of..... *printf("%s\n", q);* (2 marks)
- ii. Discuss what is expected from the code segment (4 marks)

QUESTION THREE (20 MARKS)

- a) Explain the two main categories of device drivers (2 marks)
- b) Study the code segment below and answer the following questions:
 - i. Explain the function from the following system program segment (2marks)

```
main() {
    char buf(256);
    for(;;) {
        int i
```

```

        int n = read(0,buf,256);
    if ( n <= 0 ) exit(-n);
        for ( i=0; i<n; i++ )
            if ( buff(i) == '\r' )
                buff(i) = '\n';
        write(1,buf,n);
    }
    exit(0);
}

```

- ii. Specify the output from this code segment (1mark)
- c) Explain the term “*device drivers*” (1 mark)
- d) Elaborate the functional use of each of the following drivers in a computer system(5 marks)
 - i. NUL
 - ii. CON
 - iii. \$CLOCK
 - iv. AUX
 - v. PRN
- e) Explain the term device driver and state its role system functionality (3 marks)

QUESTION FOUR (20 MARKS)

- a) Explain the term boot sector (2 marks)
- b) Justify why the boot sector viruses are dangerous in a computer System. (4 marks)
- c) Distinguish between the following terms:
 - i. Monolithic and Microkernel architectures (2 marks)
 - ii. Applications programming and systems programming, (2 marks)
- d) Write the Linux command(s) to change the permissions of your file **/usr/home/file.dat** as follows: (6 marks)
 - i. You can read, write and execute
 - ii. The users in your group can read and execute, but cannot write
 - iii. rest of users can only read
- e) Discuss what is function of the following program extract (4 marks)


```

#include <dos.h>
void test( void ) {
    union REGS pregs;
    pregs.h.ah = 0x13; /* Function number */
    pregs.h.dl = 0; /* Any value */

```

QUESTION FIVE (20 MARKS)

- a) Explain Shell variables with respect to systems programming: (2marks)
- b) Elucidate the term computing environment and discuss any three major computing environments (4marks)
- c) The most consistent way to shut down a UNIX system properly via the command is by use of one of several appropriate commands supported by UNIX. Discuss FOUR of these commands; clearly specify the effects of each on the system during the shutdown process. (4 marks)
- d) Discuss using a diagram how Remote Procedure Calls are processed, between a client and a server (6marks)
- e) Discuss the step by step program translation process (4 marks)