(b) What are the main advantages of using Layered Approach over Simple Structure for Operating System design? What are the disadvantages of using the Layered Approach? (4)

(c) What do you understand by Swapping? List any two reasons why swapping is not supported on Mobile systems. (2)

[This question paper contains 8 printed pages.]

22 DEC 2022   Your Roll No.............

Sr. No. of Question Paper : 1703

Unique Paper Code   : 42344304

Name of the Paper   : Operating System

Name of the Course   : **B.Sc. Programme / B.Sc. Mathematical Science**

Semester   : III [Admission of 2019-2021]

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question no. **1** is compulsory.

3. Attempt any **FIVE** questions from Question no. **2** to **8**.

1. (a) Which address binding scheme generates different logical and physical addresses? (1)

(b) Name the scheduler responsible for transition of a process from ready to running state. (1)

P.T.O.
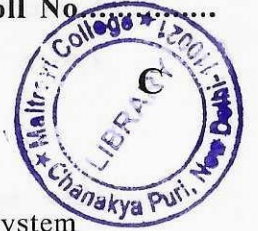
(c) Name the piece of code that loads operating system into the memory and starts its execution.

(1)

(d) How many new processes are created in the following code? (2)

```
main()
{
int i;
for (i=0;i<3;i++)
    fork();
}
```

(e) Briefly describe any two advantages of Multiprocessor systems. (2)

(f) Which of the following instructions are privileged?

(i) Set value of timer

(ii) Read the clock (2)

(b) Explain three different uses of 'cat' command. Illustrate with suitable examples. (3)

(c) Discuss the main advantage of Demand Paging. How is Effective Access Time computed for a demand-paged memory? (3)

7. (a) Given memory partitions of 100KB, 500KB, 200KB, 300KB and 600KB (in order), how would each of the Best-fit and Worst-fit algorithms place processes of size 212KB, 417KB, 120KB and 426KB (in order)? Which algorithm makes the most efficient use of memory? (6)

(b) Differentiate between external and internal fragmentation by taking suitable examples. (4)

8. (a) Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames.

(i) How many bits are there in the logical address?

(ii) How many bits are there in the physical address? (4)

P.T.O.

(c) Name the system programs which perform the following tasks : (3)

    (i) Create or modify the contents of file.

    (ii) Compile a program written in high level language.

    (iii) Load a program into the main memory.

5. (a) What is a Process control block? Describe the information contained in it. (1+3)

(b) Enumerate any four activities of operating system in regard to the following :

    (i) Process Management

    (ii) File Management (2+2)

(c) List any two reasons for a parent process to terminate execution of its children processes. (2)

6. (a) Write a shell script to find the greatest common divisor of two numbers. (4)

(g) Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers):

    (i) 2378

    (ii) 9360 (2)

(h) What is the purpose of command interpreter? Why is it usually separated from the kernel? (2)

(i) Write the Linux commands for the following : (2+2)

    (i) Count the number of occurrences of the word "hello" in a file named "file1.txt".

    (ii) Sort the data in descending order of marks in a two-column file "file2.txt" containing names of students and marks obtained.

(j) Differentiate between : (2+2)

    (i) Multi-programming and Multi-tasking Operating System

    (ii) Renaming and copying a file

(k) Define the following terms : (1×4)

    (i) Dispatch Latency

    (ii) Seek Time

    (iii) Rotational Latency

    (iv) Response Time

2. Consider the following set of processes, with the length of CPU burst time given in milliseconds :

Process	Arrival Time	Burst Time
P_1	0	5
P_2	2	3
P_3	5	6
P_4	6	2

    (i) Draw Gantt charts illustrating the execution of these processes using non-preemptive Shortest Job First (SJF) and Round Robin (Time Slice = 2) scheduling algorithms.

    (ii) Calculate the turnaround time and waiting time of each process for each of the above-mentioned scheduling algorithms. (6+4)

3. (a) Consider a paging system with the page table stored in memory.

    (i) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?

    (ii) If we add TLBs and 80% of all page table references are found in the TLBs, what is the effective memory access time? Assume that the time taken to access a TLB is 20 nanoseconds. (2+4)

(b) List the circumstances under which a CPU scheduling decision may take place. (4)

4. (a) Why is it important for operating system to differentiate between CPU-bound and I/O-bound processes/jobs? Name the scheduler that takes care of this requirement. (3+1)

(b) Describe the Two-Level Directory structure with the help of a suitable diagram. (3)