

- (b) What is demand paging? What is Page fault? What are the steps to handle page fault? (1+1+3)
- (c) What is transfer rate, seek time and rotational latency in a disk? A disk has average seek time of 12ms and spins at 7200 RPM (revolutions per minute). Data transfer rate for the disk is 4MB/sec. Calculate the time required to transfer 8KB data to the disk. Assume there are no other time overheads/delays. (3+3)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4003

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Unique Paper Code : 2342572401

Name of the Paper : Operating Systems

Name of the Course : **B.Sc. (Multidisciplinary Courses of Study with Three Core Disciplines under UGCF 2022)**

Semester : IV

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is Compulsory.
3. Answer any **four** Questions from **Section B**.
4. Parts of a question must be answered together.

Section A

1. (a) Mention names of any two mass storage devices. (1)
- (b) Differentiate between mv and cp commands in Unix/Linux. (2)
- (c) List two main functions of the Operating System. (2)
- (d) What is a thread? What are the benefits of using threads in a programming environment? (1+1)
- (e) What is a two-level directory structure? (2)
- (f) What is the difference between logical and physical address? (2)
- (g) What is dual mode of operation in the context of an Operating system? (3)
- (h) Give an example for absolute path and relative path in a directory? (3)
- (i) Briefly describe the working of Shortest Remaining Time First scheduling algorithm. (3)

- (c) Given memory partition sizes of 200KB, 600KB, 100KB, 300KB and 450 KB. How would the processes of sizes 330KB, 250KB, 500KB and 350 KB be placed in the memory for first fit, best fit and worst fit algorithms. Calculate internal and external fragmentation in all three algorithms. (3×2+2)
6. (a) For a paging environment in the main memory, the logical address has two parts - page number and offset. The size of the page frame is 2K. What should be the size of the offset (in bits)? (3)
- (b) What is preemptive and non-preemptive process scheduling? Name two algorithms for each and justify your categorization into preemptive and non-preemptive. (2+4)
- (c) What are the three methods to access data in a file? Give comparison in terms of efficiency and ease of implementation. (6)
7. (a) Draw a labelled diagram showing structure of a magnetic disk. (4)

- (c) What is an Application Programming Interface (API), what are the advantages of a programming environment which uses API. (1+1)
- (d) Explain the difference between system call and system program. (2)
- (e) Each system call will require passing some parameter(s) to the Operating System. What are the three parameter passing techniques? (3)
- (f) List any 4 categories of system programs. (4)
5. (a) What is the purpose of a page table in memory management? (1)
- (b) A memory has a page size of 1 KB. determine the page number and offset for the following addresses (3×2)
- (i) 3085
 - (ii) 4205
 - (iii) 65000

- (j) What is meant by the term 'virtual address space' of a process? (2)
- (k) List two system calls for each of the following : (2+2)
- (i) Process control
 - (ii) Device management.
- (l) What is a Process Control Block (PCB)? Elaborate the information stored in it. (1+3)

Section B

2. (a) In a multiprogramming uniprocessor system, how many processes can be in running state and how many processes can be in ready state at a particular time? (2)
- (b) What is the challenge faced by the designers of Operating System while implementing Shortest Job First scheduling algorithm? (2)
- (c) A process goes through various states from its creation to termination. Illustrate the states of a process using a diagram and explain briefly the different states. (3+2)

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- (d) The following processes arrive in order P1, P2, P3, P4, P5 at time 0. Draw Gantt chart showing the execution of these processes using SJF (Shortest Job First). Calculate the average turnaround time and average wait time. (3+3)

Process	Burst Time
P1	3
P2	2
P3	7
P4	4
P5	5

3. (a) What is the Unix Kernel? (2)
- (b) What is the purpose of pipes in shell script? Give an example. (1+1)
- (c) Write a shell script to input a number N and print all the prime numbers between 1 and N. The program should be well documented. (5)

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- (d) A file named abc.txt contains following data (3×2)

Amit
Bharat
Sanjeev
Sanjay
Dhanraj
Inderjit
Sankalp

What is the output of the following commands:

(i) `grep [s] abc.txt`

(ii) `grep san [^j] cut -c 3,5 abc.txt`

4. (a) Give Unix/Linux commands to remove a file and remove a directory. (2)
- (b) Give the advantage of layered design of the Operating System (2)

P.T.O.