

(c) Consider the following page reference string:

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

Assuming demand paging with four frames, how many page faults would occur, if optimal replacement algorithm is applied. Consider that all frames are initially empty. (5)

(1500)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5859

J

Unique Paper Code : 2342572401

Name of the Paper : Operating Systems

Name of the Course : B.A. Prog. / B.Sc. (Phy. Sc. & MS)

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. Attempt any **FOUR** questions from **Section B**.
4. Parts of a question should be attempted together.

Section – A

1. (a) What is a multiprocessor system? Give one advantage of it. (3)

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- (b) List various file operations in file system. (3)
- (c) Explain briefly the task of a dispatcher. (3)
- (d) Give any three services of an operating system. (3)
- (e) Describe the information contained in an open-file table and its use. (3)
- (f) Assume that the system takes 120 nanoseconds to reference the main memory. If number of hits is 75%, then calculate effective access time for a paging scheme. (3)
- (g) What is race condition in critical section problem? (3)
- (h) Explain circular wait condition in deadlock. (3)
- (i) What is a system call? Name the system call used for creating a process. (3)
- (j) Write the three main operations performed by an operating system to deal with page fault. (3)

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Process ID	Arrival Time	Burst Time	Priority
P1	0	8	2
P2	1	10	4
P3	2	5	3
P4	3	2	1

- (i) Draw Gantt chart for Shortest Job First algorithm and calculate turnaround time for even' process.
- (ii) Draw Gantt chart for Priority based (preemptive) algorithm and calculate waiting time for every process.
7. (a) Explain tree-structured directories with the help of a diagram. (5)
- (b) Describe the issue involved in swapping In/Out a process and how it can be resolved? (5)

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(ii) Rotational latency

(iii) Bandwidth

(b) Distinguish between sequential and direct file access methods. (4)

(c) Consider a disk queue with requests for I/O to blocks on cylinders as follows : (5)

98, 183, 37, 122, 14, 124, 65, 67

The drive is currently serving a request at cylinder 58. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending request for FCFS (First come First serve) scheduling algorithms?

6. (a) What are the three necessary' conditions required for solution of the critical section problem? (5)

(b) Consider the following set of processes, with the length of CPU burst time given in milliseconds : (10)

Section - B

2. (a) Describe design objectives of an operating system from system point of view. (5)

(b) Explain the following terms : (2+3)

(i) Trap

(ii) Dual Mode operation

(c) For the given sets P (processes), R (resources) and E (edges) (5)

$P = \{P1, P2, P3\}$

$R = \{R1, R2, R3\}$

$E = \{P1 \rightarrow R1, R1 \rightarrow P2, P3 \rightarrow R2, R1 \rightarrow P3, R3 \rightarrow P3, R2 \rightarrow P1, R2 \rightarrow P2\}$

There are two instances each of resources R1 and R2 and 3 instances of resource R3. Draw Resource allocation graph. Is the given system in deadlock state? Justify your answer.

3. (a) Explain process control block and its content with the help of a diagram. (6)

(b) Consider the following change of state of process : (4)

(i) Process moves from wait state to ready state

(ii) Process moves from running to wait state

(iii) Process moves from running to ready state

(iv) Process terminates

State the choice of preemptive and non preemptive CPU scheduling algorithm in each of above cases.

(c) Consider a 40-bit logical address. Find the number of bits required to represent the page number and page offset fields. It is given that the page size is 4 KB. (5)

4. (a) Describe first-fit and best-fit memory allocation strategies. (5)

(b) Give examples of software applications that run as multi-threaded process. (4)

(c) Consider a program consists of five segments: $S_0 = 500$ KB, $S_1 = 18$ KB, $S_2 = 120$ KB, $S_3 = 670$ KB, and $S_4 = 85$ KB. Assume at that time, the available free space partitions of memory are 900-1850, 40-130, 280-400, and 2100-2600.

Answer the following :

(i) Allocate space for each of 5 segments S_0 , S_1 , S_2 , S_3 , S_4 in memory using segmentation method.

(ii) Will the allocation done in part (i) result in fragmentation? If yes, give type and size of fragmentations. (6)

5. (a) Define the following : (6)

(i) Seek time