

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2017

Programme: BE

Full Marks: 100

Course: Applied Operating System

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define time sharing system. Describe various services provided by an operating system. Describe the actions taken by a Kernel to switch context between processes? 7
b) How is a thread different from a process? Describe in detail about the different state transition model of a process. 8
2. a) Let five processes; A, B, C, D and E be on queue in a scheduler. They arrived in the queue at the instance; 0ms, 3ms, 3ms, 6ms, and 9ms respectively. The time they require to complete is 2 ms, 5ms, 10ms, 4ms, and 4ms respectively. Using FCFS, STRF and RR (quantum=2ms), evaluate the given scenario. On the basis of average wait time, average response time and average turnaround time, which algorithm is suitable? Describe. 8
b) What is a race condition? Give an example of a race condition that could possibly occur when buying airplane tickets for two people to go on a trip together. 7
3. a) Consider the deadlock situation that could occur in the dining-philosophers' problem when the philosophers obtain the chopsticks one at a time. Discuss how the four necessary conditions for deadlock indeed hold in this setting. Discuss how deadlocks could be avoided by eliminating any one of the four conditions. 7
b) Explain the different File Access Methods? Describe the different issues associated with contiguous file allocation. 8
4. a) What are page replacement algorithms? Find out how many page faults occur in the following sequence of the reference string using FIFO, OPR, MRU page replacement algorithms using 4 frames. 8
7,0,3,6,8,1,2,3,7,5,0,2, 3,7,1,3,1,4, 6, 4, 7,0,5,3,1,7.

- b) What is preemptive and non-preemptive scheduling algorithm? Explain Multi level queue and multi-level feedback queue scheduling with appropriate example. 7
5. a) Disk request come to the disk driver for cylinder 26, 18, 10, 66, 92, 38, 74 and 31 in that order. A seek take 2 micro sec per cylinder move. How much seek time is needed using: (Assume no. of cylinders: 100) 8
- i. FCFS
 - ii. Closest Cylinder Next (SSTF)
 - iii. C-Scan (Initially moving upward)
 - iv. Look (Initially moving downward)
- b) What are tertiary storage devices? Explain about any two such devices. 7
6. a) Describe Coalescing and compaction. Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory. 8
- b) Explain directory structure and its types. Explain about access control list (ACL). 7
7. Write short notes on: (Any two) 2x5
- a) System call
 - b) DMA and Polling
 - c) Demand Paging

POKHARA UNIVERSITY

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Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are batch, time-sharing, parallel and real-time operating systems? Discuss their characteristics. 7
b) What is Process? Draw and describe process state diagram. What types of operations are performed in a process? 8
2. a) What are the requirements for the solution of critical section problem? Explain the software solution for critical section problem. 7
b) From the following set of information, determine the average waiting time and average turn around time using FCFS, RR (Quantum = 2) and HRRN 8

Process	Arrival Time	Service Time (Burst Time)
A	0	3
B	2	6
C	4	4
D	6	5
E	8	2

3. a) What is dispatcher and dispatch latency? Differentiate short-term scheduler, medium term scheduler and long-term scheduler. 7
b) Consider the following Snapshot of a system: 8

Processes	Allocation	Max	Available
	ABCD	ABCD	ABCD
P0	0012	0012	1520
P1	1000	1750	
P2	1354	2356	
P3	0632	0652	
P4	0014	0656	

Answer the following questions using the Banker's algorithm:

- i. What is the content of the matrix need?

- ii. Is the system in a safe state? Also find the safe sequence.
 - iii. If the request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately?
4. a) Describe the actions taken by a kernel to context-switch between processes. Provide two programming examples in which multithreading does not provide better performance than a single-threaded solution? 7
- b) What is page fault? Consider the following page reference strings: 1, 3, 5, 3, 7, 1, 5, 3; 1, 2, 3, 7, 6, 3, 4, 1, 8. How many page faults would occur for each of the following page replacement algorithms assuming 3 and 4 pages a frame? In each case which algorithm performs better? 8
 - i. LRU page replacement
 - ii. FIFO page replacement
 - iii. Optimal page replacement
5. a) Disk requests come in to the disk driver for cylinders 10, 22, 20, 2, 40, 6, and 38, in that order. A seek takes 6.25msec per cylinder moved. How much seek time is needed for? 7
 - i. FCFS
 - ii. SSTF
 - iii. SCAN(initially moving downward)
 - iv. CSCAN(initially moving upward)

In all cases, the arm is initially at cylinder 20.
- b) What are the advantages and disadvantages of supporting memory mapped I/O to device control registers? 8
6. a) What is bad sector? Describe the different bad block recovery mechanisms in disk management. 7
- b) How free-space management is done in file systems? Explain. 8
7. Write short notes on: (Any two) 2×5
 - a) DMA
 - b) Sequential File Access Method
 - c) RAID

POKHARA UNIVERSITY

Level: Bachelor
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Course: Applied Operating System

Semester: Spring

Year : 2018
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Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is an operating system? Describe time sharing, real-time and distributed operating systems in brief. 8
b) What is CPU bound and I/O bound processes? Explain blocking and non-blocking message passing and shared memory for Interposes communication. 7
2. a) Why is process synchronization needed? What problems may occurred if they are not synchronized? Describe Peterson's algorithm in detail 8
b) What is deadlock? How do you determine the state of system is safe or unsafe using banker's algorithm for multiple resources type? 7
3. a) Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here: 8

i	T(P _i)
0	80
1	20
2	10
3	20
4	50

Suppose a system uses SJN scheduling.

- i. Create a Gantt chart illustrating the execution of these processes?
 - ii. What is the turnaround time for process p₄?
 - iii. What is the average wait time for the processes?
- b) What are the internal and external memory fragmentations? How are they resolved in paging? Explain in detail. 7
4. a) What is internal and external fragmentation? Consider the following page reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. 8

How many page faults would occur for the following replacement algorithms, assuming three and four frames? In each case which algorithm perform better?

- i. LRU page replacement
 - ii. FIFO page replacement
 - iii. Optimal page replacement
- b) What are the different I/O techniques? Describe each in brief. 7
5. a) A disk has 8 sectors per track and spins at 600 rpm. It takes the controller 10 ms from the end of one I/O operation before it can issue a subsequent one. How long does it take to read all 8 sectors using the following interleaving systems? 7
- i. No interleaving
 - ii. Single interleaving
 - iii. Double interleaving
- b) Explain the I/O in UNIX system. 8
6. a) What are the different files access methods? Explain in detail. 7
- b) What is file system interface? Explain different file allocation methods. 8
7. Write short notes on: (Any two) 2×5
- a) System Call
 - b) User and kernel threads
 - c) RAID

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Applied Operating System

Semester: Fall

Year : 2019
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) Define time sharing, parallel and real-time operating systems? How they are different from one another? Explain. 8
- b) Differentiate between process and thread. What are the benefits of threads? Explain different process states and possible transitions using a diagram. 7
2. a) Consider following set of processes along with their burst time, arrival time and priorities. Calculate average waiting time and average turnaround time using following scheduling algorithms. 8
 - i. FCFS
 - ii. SJF
 - iii. Priority (Preemptive)
 - iv. HRRN

Process	Arrival Time	Burst Time	Priority
A	0	3	5
B	2	6	4
C	4	4	1
D	6	5	3
E	8	2	2
F	3	4	1

- b) What is mutual exclusion? Show how mutual exclusion can be achieved using Peterson's Solution. 7
3. a) Define critical section problem. What is busy waiting? Explain semaphore and its use in critical-section problem with example. 7

- b) Suppose we have two resources, A, and B. A has 6 instances and B has 3 instances. Can the system execute the following processes without deadlock occurring? 8

Processes	Allocated		Maximum Need	
	A	B	A	B
P0	1	1	2	2
P1	1	0	4	2
P2	1	0	3	2
P3	0	1	1	1
P4	2	1	6	3

4. a) Define swapping. Explain contiguous and non-contiguous memory allocation scheme with their advantages and disadvantages. 8
- b) Define page fault. How many page faults occur for the following reference strings for 3 page frames: 3, 4, 5, 6, 5, 3, 6, 4, 7, 4, 3, 4, 5, 6, Using Second Chance, LRU, and FIFO replacement algorithm. 7
5. a) What are different ways to input/output? Explain Interrupt-Driven input/output with diagram. 7
- b) Given the following request queue (in order): 85, 170, 24, 109, 11, 123, 60, 62 with the head initially at track 50 and the trail track being at 184. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms? 8
- FCFS
 - SSTF
 - SCAN(initially moving inward)
 - C-SCAN(initially moving outward)
6. a) List out some operation on file. Explain different file access method with their advantages and disadvantages. 7
- b) What is file? Explain different free space management strategy in file systems. 8
7. Write short notes on: (Any two) 2×5
- OS services and system calls
 - Demand paging and Thrashing
 - Bad Sectors handling in OS.

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2019

Programme: BE

Full Marks: 100

Course: Applied Operating System

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) What are system calls? Explain different categories of system calls with example? 8
- b) What is process control block? How can a process and thread be differentiated? Elaborate process life cycle by providing its stage and life cycle. 7
2. a) What are semaphores? Explain solution to producer-consumer problem using semaphores. 7
- b) Consider a multilevel feedback queue scheduling (MLFBQ) with three queues q1, q2, and q3. q1 and q2 use round-robin algorithm with time quantum (TQ) = 5, and 4 respectively, q3 use first-come first-service algorithm. Find the average waiting time (A.W.T) and average turnaround time (A.T.A.T) for executing the following process? 8

Processes	P1	P2	P3	P4
Burst Time	8	22	4	12

3. a) Describe using bankers algorithm if the system is in safe state. 8

Process	Allocation	Max	Available
	A B C	A B C	A B C
P ₀	0 1 0	7 5 3	3 3 2
P ₁	2 0 0	3 2 2	
P ₂	3 0 2	9 0 2	
P ₃	2 1 1	2 2 2	
P ₄	0 0 2	4 3 3	

- b) Consider following set of processes along with their burst time, arrival time and priorities. Calculate average waiting time and average turnaround time using following scheduling algorithms. 7
 - i. FCFS

- ii. SJF
- iii. Priority (Preemptive)
- iv. HRRN

Process	Arrival Time	Burst Time	Priority
A	0	3	5
B	2	6	4
C	4	4	1
D	6	5	3
E	8	2	2

4. a) How many page faults occur for the following reference strings for 3 page frames:
2, 3, 4, 5, 4, 2, 5, 3, 6, 3, 2, 3, 4, 5, Using MFU, LRU, and Optimal page replacement algorithm. 8
- b) Differentiate between paging and segmentation along with their figures. 7
5. a) Disk request come to the disk driver for cylinder 16, 18, 12, 6, 25, 38, 7 and 36 in that order. A seek take 2 micro sec per cylinder move. How much seek time is needed for
 - i. FCFS
 - ii. Closest Cylinder Next
 - iii. C-Scan (Initially moving upward)
 - iv. Scan (Initially moving downward)
 In all cases, the arm initially at cylinder 18. Also describe which one is best algorithm and why?
- b) What are different ways to input/output? Explain Interrupt-Driven i/o with diagram. 8
6. a) What are the different operations performed in files? Describe the ways by which directories can be accessed. 8
- b) How data is maintained and managed using RAID technology? Is there any chance of losing data using it? Describe each of available model in details. 7
7. Write short notes on: (Any two) 2×5
 - a) Batch Systems
 - b) Protection on files
 - c) DMA

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Applied Operating System

Semester: Fall

Year : 2020
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) What is an Operating System and how can it be used as a user interface? Explain with suitable diagram. Define multiprogramming, spooling in operating system. 8
b) What is the critical section? What are the minimum requirements that should be satisfied by a solution to critical section problem? 7
2. a) What are semaphores? Explain solution to producer-consumer problem using semaphores. 7
b) From the following set of informations, Compare the average waiting time and average turn-around time using FCFS, SJF(preemptive and non-preemptive), RR(quantum=2). 8

Processes	Arrival Time	Burst Time
P1	0	10
P2	1	6
P3	2	12
P4	3	15

3. a) Define IPC. What are different methods used for logical implementations of message passing systems. 7
b) Explain the algorithm of Resource Allocation Graph. Consider a system with three processes (P0-P2) and four allocable resources (A, B, C, D). The total four resources types in the amount as $E = (4, 2, 3, 1)$. The current allocation matrix and request matrix are as follows. 8

Using Banker's algorithm find:

i) What will be the context of need matrix?

ii) Is the system in safe state? If yes, then what is the safe state sequence?

Current Allocation Matrix					Allocation Request Matrix				
Process	A	B	C	D	Process	A	B	C	D
P0	0	0	1	0	P0	0	1	2	1
P1	2	0	0	1	P1	0	0	1	0
P2	0	1	2	0	P2	1	0	2	0

1. a) Define page fault. How many page fault occur for the following reference string for four page frame using Optimal page replacement and LRU algorithms? reference string : 1,3,1,5,7,7,3,7,4,9,8,1,6,3,4,2,5,8 7
 b) Explain about Fixed partition and Variable partition. Consider a swapping system in which memory space is as: 400, 700, 1200, 250, 300 bytes. File sizes are as: 900, 25, 600, 200, 300 bytes. Find the total fragmentation using (i) First Fit (ii) Next fit (iii) Best fit (iv) Worst fit 8
5. a) Suppose the following request queue (in order): 74, 168, 23, 109, 10, 122, 59, 62 with the head initially at track 48 and the trail track being at 174. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms? 8
 i. FCFS
 ii. SSTF
 iii. SCAN (initially moving downward)
 iv. C-SCAN (initially moving upward)
 b) Differentiate between Paging and Segmentation. Explain inverted page table. 7
6. a) What are the three different ways to do input- output? Explain all. 8
 b) What are the different methods used for accessing a file? Compare and contrast all the methods and explain which method is best in term of fast execution of the file. 7
7. Write short notes on: (Any two) 2×5
 a) RAID
 b) Direct Memory Access
 c) PCB
 d) Interrupt handling

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2021

Programme: BE

Full Marks: 100

Course: Applied Operating System

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) Define operating system. How operating system creates abstraction? Explain with reference to operating system as extended machine. 7
b) What is process and process state? Do you think a process can exist without any state? Justify your answer with the help of a process state diagram and PCB. 8
2. a) Why semaphores are used? Give solution to reader-writer problem using semaphores. 7
b) Suppose 5 batch jobs A, B, C, D and E arrived at the service center at time 0. They have burst time 20, 22, 8, 12 and 14 respectively. Their priorities are 4, 2, 1, 3 and 5 with 5 being the highest priority. For each of the scheduling algorithm determine average waiting time (WT) and average turn-around time (TAT) using: 8
 - i. SJF
 - ii. RR (Quantum size 10)
 - iii. Priority (preemptive)
3. a) Consider following snapshot of a system 8

Processes	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	0	1	0	0	1	1	5	2
P1	1	0	0	1	7	5			
P2	1	3	5	2	3	5			
P3	0	6	3	0	6	5			
P4	0	0	1	0	6	5			

Answer the following questions using Banker's algorithm:

- i) What is the content of Need Matrix ? 7
- ii) Is the system in a safe state? Also find the safe sequence.
- b) Explain different multithreading operating system designs with advantages and disadvantages.
- a) What is mutual exclusion? Show how mutual exclusion can be achieved using Dekkers Algorithm? 7
- b) How many page faults occur for following reference strings for 4 page frames? 8
 5, 0, 1, 2, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 1, 2, 0, 3
 Using FIFO, LRU and Optimal page replacement algorithm
- i. a) Disk request come to the disk driver for cylinder 16, 18, 12, 6, 25, 38, 7 and 36 in that order. A seek take 5 micro sec per cylinder move. How much seek time is needed for 8
 i. FCFS
 ii. SSTF
 iii. C-SCAN (upward)
 iv. C-LOOK (downward)
 In all case, the arm is initially at cylinder 18.
- b) What is difference between Paging and Segmentation? What are different page-table structures? Explain any one in detail. 7
5. a) Describe Interrupt. How Operating system handles the interrupt? Explain with the help of a block diagram 8
- b) What is file descriptor? Discuss about different file allocation methods. 7
7. Write short notes on: (Any two) 2×5
 a) Stable storage Implementation
 b) File Protection
 c) RAID

POKHARA UNIVERSITY

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Semester: Spring

Year : 2021

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Full Marks: 100

Course: Applied Operating System

Pass Marks: 45

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Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is system call? Define major services of operating system. 8
b) What is CPU bound and I/O bound process? Why inter process communication is required? Explain. 7
2. a) Explain the algorithm of Resource Allocation Graph. Consider a system with three processes (P0-P2) and four allocable resources (A, B, C, D). The total four resources types in the amount as $E = (4, 2, 3, 1)$. The current allocation matrix and request matrix are as follows. 8
Using Banker's algorithm find:
i) What will be the context of need matrix?
ii) Is the system in safe state? If yes, then what is the safe state sequence?

Current Allocation Matrix					Allocation Request Matrix				
Process	A	B	C	D	Process	A	B	C	D
P0	0	0	1	0	P0	0	1	2	1
P1	2	0	0	1	P1	0	0	1	0
P2	0	1	2	0	P2	1	0	2	0

- b) For what purpose semaphores are used? Give solution to producer-consumer problem using semaphores. 7
3. a) How process differs from thread? Explain and differentiate between user and kernel thread. Draw figures to illustrate. 8
b) What mutual exclusion, race condition and critical condition? Can Peterson's algorithm is guaranteed to solve critical condition problem. Justify your answer. 7

4. a) Define page fault. How many page fault occur for the following reference string for four page frame using Optimal page replacement and LRU algorithms? 8
reference string : 1,3,1,5,7,7,3,7,4,9,8,1,6,3,4,2,5,8
- b) Explain about Fixed partition and Variable partition. Consider a swapping system in which memory space is as: 7
400, 700, 1200, 250, 300 bytes.
File sizes are as: 900, 25, 600, 200, 300 bytes
Find the total fragmentation using
- First Fit
 - Next fit
 - Best fit
 - Worst fit
5. a) Consider the following request queue (in order): 80, 178, 24, 110, 11, 123, 61, 68 with the head initially at track 45 and the trail track being at 189. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms? 8
- FCFS
 - SSTF
 - SCAN (initially moving outward)
 - C-SCAN (initially moving inward)
- b) What is fragmentation? Explain segmentation with paging with an example. 7
6. a) What are the three different ways to do input- output? Explain all. 7
- b) What are different file operations? Discuss different file access methods. 8
7. Write short notes on: (Any two) 2x5
- PCB
 - Interrupt Handling
 - DMA
 - File security in Linux

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Applied Operating System

Semester: Fall

Year : 2022
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) Describe the two basic purposes of Operating system. Differentiate time sharing system from real time system with examples. 7
b) What is race condition and critical section? Give hardware solution to achieve mutual exclusion. 8
2. a) Producer Consumer problem can be solved with the help of various techniques. Suggest any one of the techniques to solve producer consumer with detailed explanation. 7
b) Given the following information, draw GANTT charts and find the average waiting time and average turn-around time using FCFS, SRTN, RR (Quantum=3), HRRN. 8

Process	Arrival Time	Burst Time
A	0	9
B	3	3
C	4	4
D	6	10

3. a) What are the conditions of deadlock ? Use Banker algorithm to find whether the system is in deadlock or not? 8

Process	Allocation			Maximum			Available A. B. C
	A	B	C	A	B	C	
P1	0	1	0	7	5	3	3 2 3
P2	2	0	0	3	2	2	
P3	3	0	2	9	0	2	
P4	2	1	1	2	2	2	
P5	0	0	2	4	3	3	

- b) When multiple processes need to co-operate, there is a choice between 7

shared memory and message passing. Compare and contrast these techniques. What is the role of the operating system in each?

4. a) What is semaphore? State and give solution to dining philosopher problem. 7
- b) Given references to the following pages by a program 0,4, 1, 4, 2, 4, 3, 4, 2, 4, 0, 4, 1, 4, 2, 4, 3, 4,. How many page faults will occur if the program has four page frames for each of the following algorithms?
a. FIFO. b. Optimal. c. LRU d. Second chance 8
5. a) Discuss in detail the use of TLB in the process of paging. Support your answer with the help of a diagram. 7
- b) Consider the following request queue (in order): 72, 171, 26, 109, 10, 125, 62, 67 with the head currently at track 50 and the previous head track was at 45. Starting from the current head position, what is the total head movement to satisfy all the pending requests, for each of the following disk-scheduling algorithms? Assume disk size 180 cylinders. 8
 - i. FCFS
 - ii. SSTF
 - iii. SCAN
 - iv. LOOK
6. a) Explain Programmed Driven I/O and Interrupt Driven I/O with Suitable diagrams. 7
- b) What are different file attributes? Explain file system allocation. 8
7. Write short notes on: (Any two) 2x5
 - a) Sector slipping v and Sector Sparing.
 - b) RAID
 - c) Directory Structures

POKHARA UNIVERSITY

Level: Bachelor
 Programme: BE
 Course: Applied Operating System

Semester: Fall

Year : 2023
 Full Marks: 100
 Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) What are main purposes of Operating Systems? Can OS be called as a resource manager and an extended machine? Justify. 8
 b) What is a process? Explain the different states of process with a neat diagram. 7
2. a) Define semaphores. How Dining Philosopher problem can be solved using semaphores? Explain with necessary pseudo code. 7
 b) Consider following set of processes along with their burst time, arrival time and priorities. Calculate average waiting time and average turnaround time using following scheduling. Also describe which one is the best algorithm and why? 8
 - i. SRTF
 - ii. Priority
 - iii. RR (Quantum size = 3ms)

Process	Burst Time	Arrival Time	Priority
P1	3	0	2
P2	14	1	1
P3	9	2	3
P4	17	3	4

3. a) Consider following snapshot of a system 8

Processes	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
A	0	1	1	1	2	3	0	1	0
B	1	1	0	2	2	0			
C	0	0	1	0	1	1			
D	1	2	1	3	5	3			
E	1	0	1	1	1	2			

Answer the following questions using Banker's algorithm:

- i. What is the content of the Need Matrix?
- ii. Is the system in a safe state? Also find the safe sequence.

- b) Define thread. Why is it called a light weight process? Compare and contrast between process and thread. 7
4. a) Explain race condition and critical condition. Can Peterson's algorithm be guaranteed to solve critical condition problem. Justify your answer. 7
- b) What is page fault? Given below is the reference made to the following pages by a program: 1,3,1,5,7,7,3,7,4,9,8,1,6,3,4,2,5,8. Show the successive page residing in the four frames using replacement policy below: 8
- Second Chance
 - LRU
 - Optimal
5. a) The disk track requests are: 111, 123, 250, 298, 120, 13, 288 and 224. There are 300 cylinders numbered from 0 to 299. Assume that the last request is at track 130 and the head is moving towards track 0. Find out the total seek time for each of the disk scheduling algorithms below: 8
- SSTF
 - C-SCAN
 - LOOK
- b) Difference between Fixed partition and Variable partition. 7
- Consider a swapping system in which memory space is as: 400, 750, 1200, 250, 150 bytes.
- File size are as: 200, 75, 600, 900, 300
- Find the total fragmentation using
- First Fit
 - Next fit
 - Best fit
 - Worst fit
6. a) What are the problems of programmed and interrupt driven I/O techniques? How does DMA solve these problems? Explain in detail. 8
- b) Explain all methods used for file allocation. Compare and contrast all the methods with appropriate diagrams. 7
7. Write short notes on: (Any two) 2x5
- Free space management
 - Scan vs CScan
 - Stable Storage Implementation

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2023

Programme: BE

Full Marks: 100

Course: Applied Operating System

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define time sharing, parallel and real-time operating systems? How they are different from one another? Explain. 8
- b) Describe the fields in a process control block (PCB) with diagram. What is switching overhead? 7
2. a) Define Semaphores. Explain solution to the Dining Philosophers Problem using semaphores. 7
- b) Given the following information's, draw GANTT charts and find the average waiting time and average turn-around time using STRF, RR (quantum=4), HRRN. 8

Process	Arrival Time	Burst Time
A	0	10
B	3	4
C	6	6
D	7	9

3. a) How many page faults occur for the following reference strings for 3-page frames using Optimal, LRU, and Second Chance? 8
4, 6, 7, 8, 7, 4, 8, 6, 9, 6, 4, 6, 7, 8. Also calculate fault ratio.
- b) What do you mean by disk management? Compare sector Slipping and Sector Sparing in bad block recovery during disk management. 7
4. a) What is deadlock? Consider the following snapshots of the system having 10 instances of resource A, 5 instances of resource B and 7 instances of resource C. 8

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Answer the following questions using the Banker's Algorithm:

- i. Is the system in a safe state? Also find the safe sequence.
 - ii. If the request from process P1 arrives for (1, 0, 2) can the request be granted immediately?
- b) What is Memory Fragmentation? What are its types? How can the problem of fragmentations be solved? 7
5. a) Suppose a disk drive has 300 tracks, numbered 0 to 299. The current position of the R/W head is at track 160 and the previous request was at track 145. The sequence of pending requests is 43, 172, 150, 48, 85, 270, 290, 130. Starting from current position what is the total number of track movements (distance) for the following disk scheduling algorithms. 8
- i. SSTF
 - ii. SCAN
 - iii. C-LOOK
 - iv. FCFS
- b) Explain interrupt driven I/O with diagram. How is it different from polled I/O? 7
6. a) What are different file attributes? Discuss different file allocation methods. 8
- b) What is File? Compare the characteristics of various file access methods. 7
7. Write short notes on: (Any two) 2×5
- a) RAID
 - b) System Calls
 - c) Deadlock vs. Starvation