

C	4	4	1
D	6	5	3
E	8	2	2

- e) How many page faults occur for following reference strings for three page frames? 8

7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,1,2,0,3

Using LRU, FIFO and Optimal page replacement algorithm.

- b) Differentiate virtual page and a page frame. What is the difference between LRU and NRU page replacement algorithms? 7
- a) Disk request come to the disk driver for cylinder 6, 8, 18, 16, 25, 38 and 36 in that order. A seek take 5msec per cylinder move. How much seek time is needed for 8

- 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) Give a scenario where choosing a large file-system block size might be a benefit. Give an example where it might be a hindrance. 7

- a) Describe OSI layered architecture. How it is important in network architecture of operating system? 7

- b) Describe the process management scheme in either Linux or Microsoft-Windows OS. 8

Write short notes on: (Any two) 2x5

i. Peterson's Algorithm

ii. Context Switching

iii. Windows 2000.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Semester: Fall

Course: Operating System

Year : 2014

Full Marks: 10

Pass Marks: 45

Time : 3 hrs.

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 Operating System. Explain different services provided by operating system. 8
- b) Draw and describe process state diagram. What types of operations are performed in a process? 7
2. a) Do you feel deadlock is great enemy of computer system? If yes, why? Also write protection mechanism for deadlock. 6
- b) When multiple processes need to cooperate, there is a choice between shared memory and inter-process communication (IPC). Compare and contrast these two techniques. What is the role of the operating system in each? 7
3. a) Explain how the producer-consumer problem is relevant to an operating system. Describe briefly the semaphore based solution to this problem. 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.
 - i. FCFS
 - ii. SJF
 - iii. Priority (Preemptive)
 - iv. HRRN

Process	Arrival Time	Burst Time	Priority
A	0	3	5
B	2	6	4

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Operating System

Semester – Spring

Year : 2015

Full Marks : 100

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 the difference between kernel mode and user mode? Why is the difference important to an operating system? 7
- b) "OS is simply considered as Resource manager as well as Virtual machine", Why? Explain in your own words. 8
2. a) Define process. Why different process states are essential in multiprogramming? Justify with an example. 5
- b) Why mutual exclusion is required in multiprogramming? Explain with an example of an appropriate race condition case. 5
- c) What is the difference between deadlock and starvation? What are the strategies used to solve the problem of deadlock? 5
3. a) What are the advantages and disadvantages of using the same systemcall interface for manipulating both files and devices? 6
- b) Consider the following set of processes, along with their burst time (in milliseconds), arrival time and priorities. Calculate average waiting time and average turnaround time using following scheduling, Also describe which one is best algorithm and why. 9
 - i. FCFS
 - ii. SJF
 - iii. Priority (Preemptive)
 - iv. RR (Quantum size=1ms)

Process	Arrival Time	Burst Time	Priority
P ₁	0.0	8	2
P ₂	0.4	4	1
P ₃	1.0	1	3
P ₄	0.0	8	4

4. a) What is a TLB? How does the TLB map virtual and real addresses? Explain with mapping diagram? 8
- b) Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB and 600 KB (in order), how would the first-fit, best fit and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order)? Which algorithm makes the most efficient use of memory? 7

5. a) What is RAID? Explain Levels of RAID with suitable diagram.
b) What is a file? Explain different file allocation techniques in OS.
6. a) What is the distributed operating system? Explain Remote Procedure Call (RPC) with the help of an appropriate figure.
b) Why distributed system is growing rapidly than centralized system? Give reasons. What are the advantages and disadvantages of a distributed operating system?
7. Write short notes on (Any Two):
 - a) Amoeba System Architecture
 - b) DOS
 - c) Device Controllers

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Operating System

Semester: Fall

Year : 2016

Fuli Marks: 100

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.

- a) What is the difference between multitasking and multiprogramming? List the essential properties for the Batch-oriented and time sharing operating system. 8
- b) Explain process control block (PCB) and process states in detail. 7
- a) What are safe, unsafe states and deadlock? Explain banker's algorithm for dead lock detection. 8
- b) Define thread. Why it is called light weight process? Compare and contrast between process and thread. 7
- a) What do you mean by concurrent process? Describe any two methods for process synchronization. 7
- b) Schedule the following processes applying (Highest Response Ratio Next) HRN scheduling algorithm. Assume that P1 is the first process and processor is instantly available for processing. 8

Process	P1	P2	P3	P4	P5
Arrival Time	1ms	2ms	4ms	7ms	9ms
Service Time	5ms	6ms	4ms	7ms	8ms

- i. Find waiting time and turnaround time for each process and Find the order of execution.
- ii. Change the arrival time of P4 and P5 to 6ms find the execution order.
- a) Draw and describe memory hierarchy diagram. How virtual memory increases the performance of computer system? Describe in detail. 7
- b) How many page fault occurs for your algorithm for the following reference string for three frames:

1, 1, 2, 2, 1, 4, 2, 3, 3, 5, 5, 4

Using FIFO, Optimal, LRU, and LFU page replacement algorithm?

- 5. a) Distinguish between block oriented and character oriented I/O devices. Explain the various steps involved in DMA transfer. 7
- b) Explain I-node and linked list allocation based file system implementation. 8
- 6. a) Define distributed operating system. Write about the issues that have to be considered while designing Distributed OS. 8
- b) What do you mean by context switching? Explain how context switching is done. How context switching helps for multiprogramming? 7
- 7. Write short notes on: (Any two) 2x5
 - a) RPC(Remote Procedure Call)
 - b) RAID
 - c) Linux operating system

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Operating System

Semester: Spring

Year : 2016
Full Marks: 100
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) What is an operating system? Explain the different major function of Operating System. 7
- b) What is process? Illustrate and define the different state of process with neat diagram. 8
2. a) Define deadlock and its causes. Explain deadlock prevention methods. 8
- b) What is the relationship between Thread and Process? Multi-programming (or multi-tasking) enables more than a single process to apparently execute simultaneously. How is this achieved on a uniprocoessor? 7
3. a) Differentiate the role between kernel mode and user mode in operating system. 7
- b) Schedule the following processes applying following scheduling algorithm: 8

Process	Burst Time
P ₁	15
P ₂	20
P ₃	4
P ₄	9
P ₅	17

4. a) FCFS, SJF and Round Robin (quantum = 4 mili seconds)
Which algorithm would give the minimum average waiting time? 7
- b) "Optimal Page replacement algorithm have lesser page fault than the FIFO Page replacement". Is the above statement correct? Explain your answer with proper examples. 8
- b) What is a TLB? How does the TLB map virtual and real addresses? 8

Explain with mapping diagram.

5. a) Consider a disk queue with requests for I/O to blocks on cylinders in that order: 43, 79, 142, 56, 34 and 187. There are 200 cylinders numbered from 0 - 199 and the disk head starts at number 109. What is the total distance that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms?
 - i. FCFS
 - ii. SSTF
 - iii. SCAN
- b) What is file system implementation? Explain Contiguous List and Linked List file system implementations with their relative advantages and disadvantages.
6. a) Define Network Architecture. Describe OSI layered architecture.
- b) How distributed shared memory is different from message passing? Explain process management technique in Linux.
7. Write short notes on: (Any two)
 - a) File System in Windows 2000
 - b) Race Condition
 - c) Context Switching

POKHARA UNIVERSITY

8 Level: Bachelor Semester: Fall Year : 2017
Programme: BE Full Marks: 100
Course: 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 system call. Explain Operating system as resource manager. | 7 |
| | b) Explain process states with suitable diagram. Draw the queuing diagram For 5 state process model. | 8 |
| 2. | a) What is Race Condition? What is the cause of race condition? Explain TSL Solution for Race Condition. | 7 |
| | b) Why do we need IPC? Explain about Peterson's algorithm. | 8 |
| 3. | a) Explain conditions for deadlock. Explain two phase locking. | 7 |
| | b) What do you mean by kernel? Explain the kernel implementation of process. | 8 |
| 4. | a) Schedule the following processes applying following scheduling algorithm: | 8 |

Process	Burst Time
P ₁	10
P ₂	15
P ₃	5
P ₄	10
P ₅	15
P ₆	8

FCFS, SJF and Round Robin (quantum = 3 milis seconds)

Which algorithm would give the minimum average waiting time?

- b) What is Page Fault? Given below is the references made to the following pages by a program: 0, 2, 4, 1, 5, 1, 4, 3, 0, 3, 1 Show the successive pages residing in the three frames using replacement policy below. Also, state how many page faults will occur for each of the Replacement policies.

 - FIFO Page Replacement

- ### i. FIFO Page Replacement

- ii. NRU Page Replacement
iii. Optimal Page Replacement

5. a) Explain Direct Mapping and Block Mapping Techniques? What is TLB?
b) Consider a disk queue with requests for I/O to blocks on cylinders in that order: 43, 79, 142, 56, 34 and 187. There are 200 cylinders numbered from 0 - 199 and the disk head starts at number 100. What is the total distance that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms?

- i. FCFS
 - ii. SSTF
 - iii. SCAN

6. a) Define Contiguous List and Linked List file system implementations. Explain ACL with the help of diagram.

- b) What do you mean by RPC? Explain advantages and disadvantages of distributed OS.

7. Write short notes on: (Any two)

 - a) File systems in Linux
 - b) ATM (Asynchronous Transfer Mode)
 - c) Unix

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Operating System

Semester: Spring

Year : 2017

Full Marks: 100

Pass Marks: 45

Time 3 hrs

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 operating system. Explain monolithic and layered structure of operating system.
b) Define process. Differentiate between process and program.
 2. a) Explain difference between thread and process? Explain different multithreading model?
b) What make message passing IPC as one among the best method of IPC implementation? Explain with pseudo code details.
 3. a) Explain necessary and sufficient condition for deadlock. Give an algorithm for deadlock detection for a system with multiple resource of same kind.
b) Consider the Dining Philosophers problem with n philosophers but with $n+1$ forks; the extra fork is in the middle of the table and can be used by any philosopher (but only by one of them at a time), Is deadlock possible? Explain your answer.
 4. a) Define context switching (kernel mode and user mode).
b) Consider 5 processes P1, P2, P3, P4, and P5 which arrives at time 2, 6, 4, 5 and 0 units to the waiting queue. And burst time of processes are 8, 4, 6, 8, 4 units respectively. Find throughputs of the following algorithms;
 - i. HRRN
 - ii. Round Robin
 - iii. SRT
c) Define term thrashing and pre-paging. Explain Working set page replacement Algorithm with example.
 5. a) Given below is the references made to the following pages by a

program: 1,3,2,3,4,5,3,2,5,1,4,3,2,4,3,5,1,6,3,4,0,3,2 Show the successive pages residing in the four frames using replacement policy below. Also, state how many page faults will occur for each of the Replacement policies and calculate the fault rate.

- i. FIFO
ii. NRU
iii. optimal

b) The disk track requests are: 123, 250, 298, 120, 13, 300 and 224. Assume that the last request is at track 150 and the head is moving towards track 0. Find out the total seek Time for each of the disk scheduling algorithms below:

 - i. SSF
 - ii. C-SCAN
 - iii. FIFO

a) With help of necessary diagram, explain file system allocation techniques.

b) Define Distributed Operating System. Explain the similarity and dissimilarity between TCP/IP and OSI Network Architecture.

c) Differentiate between Linux and UNIX. Explain memory management technique in Linux.

Write short notes on: (Any two)

a) Flynn Taxonomy

b) Security in windows 2000

c) DMA

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2018
 Programme: BE Full Marks: 100
 Course: Operating System Pass Marks: 45
 Time : 3 hrs.

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? Explain the concept—"OS as a resource manager and OS as an extended machine." 8
- b) What is the problem associated with sleep and wake up based solution for achieving mutual exclusion? Explain how monitor overcomes this problem? 7
2. a) Differentiate between deadlock and starvation. For resources type with multiple instances, we can model resource allocation and requests as a directed graph connecting processes and resources. Explain the step involved in deadlock detection taking such graph as an example. 8
- b) Define process. Explain process control block (PCB) and explain process states and its transition. 7
3. a) What do you mean by thread? Differentiate between user level and kernel level threads. 8
- b) Explain the difference between internal and external fragmentation. How external fragmentation can be combat, illustrate with example. 7
4. a) Consider the following set of processes that arrives at time 0, with the length of the CPU burst given in milliseconds: Construct Gantt chart and calculate average waiting time. 8

Process	Burst Time	Priority
P ₁	30	2
P ₂	7	6
P ₃	5	1
P ₄	18	3
P ₅	5	5
P ₆	8	4

- i. Round Robin (quantum = 5)
 ii. Priority Scheduling (1 highest priority)
 iii. FCFS
 iv. Shortest job first
- b) How does DMA assist CPU in concurrent processing? Illustrate with block diagram. 7
5. a) What is page fault? Consider the following page reference strings: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame? In each case calculate fault ratio.
 - i. FIFO page replacement
 - ii. LRU page replacement
 - iii. Optimal page replacement
- b) How files and directories are stored in memory such that they can be managed efficiently? Explain the approaches. 7
6. a) What RPC? Show the operation of RPC in a client server computing environment taking an example and a necessary figure. 7
- b) Explain about file and disk management in Windows 2000. 8
7. Write short notes on: (Any two) 2×5
 - a) Interrupt Handler
 - b) Autoexec. bat and Config. sys files in MS-DOS
 - c) Group Communication

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Operating System

Semester: Spring

Year : 2018
Full Marks: 100
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) What are the main functions of operating system? Discuss on the different structures of operating system in brief. 8
- b) What is a process control block? How are the states and transitions associated with process? Illustrate using three state models. 7
2. a) What is a race condition and mutual exclusion? Show how mutual exclusion can be achieved using TSL (Test and set Lock). 7
- b) What is deadlock? Consider a system with four processes P0 through P3 and three resources types A,B,C. Resource type A has 8 instances, B has 6 instances and type C has 4 instances. Suppose at time t₀ following snapshot of the system has been taken. 8

Process	A	B	C
P0	2	1	1
P1	2	1	1
P2	1	2	1
P3	1	1	1

Process	A	B	C
P0	4	3	2
P1	5	4	2
P2	6	3	2
P3	3	2	1

Use resource allocation graph to model the given system.

3. a) What is critical region? Write and explain Dekker's algorithm. 8
- b) Consider the following set of information. Determine the average waiting time and average turn-around time using FCFS, SJF (Preemptive), RR (Quantum=2) and HRRN. 7

Process	Arrival Time	Service Time (Burst Time)
P1	0	7
P2	2	6
P3	4	2

4. a) Differentiate between internal and external fragmentation. How external fragmentation can be combat, illustrate with example. 7
- b) Why does page fault occur? Consider the following page reference strings: a, b, c, d, b, a, e, f, b, a, b, c, f. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame? In each case calculate fault ratio.
 - i. Second Chance page replacement
 - ii. LRU page replacement
 - iii. FIFO page replacement
5. a) What are the problems of programmed and interrupt driven I/O techniques? How does DMA solve these problems? Explain in detail. 8
- b) What is Access control list (ACL) ? Describe different file system implementation methods in brief. 7
6. a) What are different network architecture in Distributed System? 1
 Explain clock synchronization technique in distributed system. 1
- b) Describe in brief about the file system of windows and Linux. 8
7. Write short notes on: (Any two) 2x5
 - a) Deadlock Detection and Recovery
 - b) Context Switching in Kernel
 - c) Segmentation with Paging

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2019
Programme: BE Full Marks: 100
Course: Operating System Fa s 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) Explain types of kernel with necessary diagrams 7
 b) Differentiate Process and Threads. Draw five stage process state diagram and explain each stage. 8
 2. a) What is multi-threading? Explain different multi-threading model. What is the biggest advantage of implementing threads in user space? 8
 b) What are classical IPC Problems? Explain reader-writer problem. 7
 - a) Write and explain solution for producer consumer problem using semaphore variables 8
 b) What are the necessary characteristics of dead lock? Explain deadlock prevention and avoidance methods 7
 - a) Draw a Gantt chart and find average turnaround time and waiting time of the following process applying FCFS, STRF and round robin (with quantum = 3) scheduling algorithm. 8

Process	A	B	C	D	E
Arrival Time(sec)	0	3	4	6	10
Burst Time(sec)	6	3	6	4	2

- b) Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 50, and previous request was at cylinder 25. The queue of pending request is: 95, 180, 34, 119, 11, 123, 62, 64. Starting from the current head position, what is the total distance (in cylinder) that the disk arm moves to satisfy all pending request for FCFS, SSTF, SCAN and C-LOOK disk scheduling algorithm.

a) Explain the difference between internal and external fragmentation. How external fragmentation can be combat, illustrate with example.

- b) Describe the Amoeba System Architecture. How process management is done in Amoeba? 8

a) Define relative and absolute path. How file is implemented in a disk using contiguous, linked list and indexed allocation strategy? Explain with their merits and demerits? 8

b) Explain the term distributed operating system with its characteristics, advantages and disadvantages. 7

Write short notes on: (Any two) 2×5

a) File system in Unix and DOS

b) Deadlock Condition

c) RPC

POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2019
Programme: BE Full Marks: 100
Course: 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) | What are System Calls? Explain the types of System Calls. Explain the sequence of System Calls for copying one file to a new file. | 8 |
| | b) | Explain the process state transition diagram used in multiprogramming environment. Describe the fields in a process control block (PCB). What is switching overhead? | 7 |
| 2. | a) | State Producer Consumer problem. Explain how to solve it. | 8 |
| | b) | How can Mutual exclusion affect program performance? Describe sleeping barber problem with pseudo codes. | 7 |
| 3. | a) | Why is deadlock state more critical than starvation? Describe resource allocation graph with a deadlock, with a cycle but no deadlock. | 8 |
| | b) | Explain about the types of kernels. | 7 |
| 4. | a) | From the following set of information, Find the average waiting time and average turn-around time using FCFS, SJF, RR (Quantum = 3) and HRRN. | 8 |

Process	Arrival Time	Service Time (Burst Time)
A	0	7
B	2	6
C	4	8
D	7	5
E	9	4

- b) Explain the sequence of events during remote procedure call using an example; also explain why remote procedure call (RPC) doesn't fit in OSI model.

5. a) Explain the concept of Thrashing. Suggest ways to prevent it.

b) Consider the following page reference strings: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame? In each case calculate fault ratio.

 - Second Chance page replacement
 - LRU page replacement
 - FIFO page replacement

6. a) Suppose a disk drive has 400 cylinders, numbered 0 to 399. The driver is currently serving a request at cylinder 143 and previous request was at cylinder 125. The queue of pending request in FIFO order is: 86, 147, 312, 91, 177, 48, 309, 222, 175, 130. Starting from the current head position what is the total distance in cylinders that the disk to satisfy all the pending request for each of the following disk scheduling algorithms?

 - SSTS
 - SCAN
 - C-SCAN

b) How files can be allocated using Linked list and I-Node method? Describe using appropriate figures.

Write short notes on: (Any two)

 - ATM
 - Internal and External Fragmentation
 - HRN Scheduling

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Operating System

Semester: Fall

Year : 2020

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

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.

- a) What is Operating System? "Operating system acts as extended machine as well as resource manager", explain this statement. Clarify with the suitable example. 8
- b) Differentiate between process and thread. Explain the field in process control block (PCB). 7
- a) What is semaphore? Explain how you solve producer-consumer problem using semaphore. 7
- b) What is IPC? Describe its implementation using shared memory and message passing. 8
- a) Five Processes and 3 resource types A, B, C and D(Below is the snapshot of the state as: 8

Process	Max	Allocation				Available
		A	B	C	D	
P0	6 0 1 2	4	0	0	1	3 2 1 1
P1	2 7 5 0	1	1	0	0	
P2	2 3 5 6	1	2	5	4	
P3	1 6 5 3	0	6	3	3	
P4	1 6 5 6	0	2	1	2	

Is this a safe state? If yes, what is safe sequence?

- b) What are different types of threads? Explain context switching with 7

respect to kernel mode and user-mode.

- a) Given the following set of information, What is the average waiting time and average turn-around time using SJF(Preemptive), FCFS, RR (Quantum = 3) and HRRN. 8

Process	Arrival Time	Service Time (Burst Time)
A	0	8
B	2	6
C	4	9
D	7	5
E	9	4

- b) Differentiate between logical address and physical address. Explain contiguous and non-contiguous memory allocation approach with their advantages and disadvantages. 7

- a) Consider the following page reference strings: 2,3,4,5,3,2,6,7,3,2,3,4,8,7,4,3,2,3,4,7. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame? In each case calculate fault ratio. 8

- i) Optimal Page Replacement
ii) LRU page replacement
iii) FIFO page replacement

- b) Suppose a disk drive has cylinders numbered from 0 through 3999. The drive is currently serving a request at cylinder 299. The queue of pending request in FIFO order is given by 916,1509,82,1011,1774,130,507,250,2681,56. Calculate total distance (in cylinders) in FCFS, SSF and SCAN. Which one is best? 7

- a) Describe Access Control Matrix and Access Control List using an appropriate example. How it achieves a level of security in files? 7
b) Define distributed operating system. Explain Remote Procedure Call (RPC) with the help of an appropriate figure. 8

- Write short notes on: (Any two) 2x5
- a) Operating system structure
b) Clock synchronization in DS
c) LINUX operating system

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Operating System

Semester: Fall

Year : 2021
Full Marks: 100
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) What is an operating System? Discuss the main advantage for an operating system designer for using virtual machine architecture. Give the main advantage for user. 8

- b) Write advantages of threads over processes. How multiprocessor system can be effectively utilized with threads? Explain with example. 7

2. a) What is test and set instruction? Explain producer-consumer problem and algorithm for resolving it using monitor. 8

- b) Consider the deadlock situation that could occur in the dining philosophers' problem when the philosophers obtain the chopstick one at a time. Discuss how the four necessary conditions for deadlock indeed hold in this setting. Discuss how deadlock could be avoided by eliminating any one of the four conditions. 7

3. a) Write advantages of threads over processes. Explain the advantage of multithreading. 8

- b) Given the following information, draw the GANTT charts for processor scheduling for HRRN, Preemptive Shortest Job First and RR (Quantum=2). Also, find the average waiting time, average turnaround time and average response time for all the cases. 7

Process	Arrival Time	Burst Time
P1	0.0	7
P2	3.0	4
P3	5.0	2
P4	6.0	4

4. a) What is thrashing? Consider the following page reference strings: 2,3,3,4,5,6,5,7,1,2,5,8,6,4,1. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages frames?
- i. LRU page replacement
 - ii. FIFO page replacement
 - iii. Optimal page replacement
- b) Define swapping. Explain contiguous and non-contiguous memory allocation scheme with their advantages and disadvantages. 1
5. a) Suppose a disk drive has 2000 cylinders, numbered 0 to 1999. The drive is currently serving a request at cylinder 134 and the previous request was at cylinder 124. The queue of pending requests in FIFO order is 36, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 8
- Starting from the current head position what is the total distance that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms?
- i) FCFS ii) SSTF iii) SCAN iv) CSCAN
- b) What is file system implementation? Explain link list and i-node file system implementations. 1
6. a) What is distributed operating system? Explain advantage of distributed system over independent PC. 7
- b) Explain file and disk management in LINUX. 8
7. Write short notes on: (Any two) 26
- a) Context Switching
 - b) Internal vs External Fragmentation
 - c) Multilevel feedback queues

POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2021
 Programme: BE Full Marks: 100
 Course: Operating System Pass Marks: 45
 Time : 3 hrs.

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.

- a) Explain briefly about Types of OS along with its evolution in brief. 8
- b) What is a process? Explain various states and transitions between the states of process. 7
- a) What is a deadlock? Explain with example dead lock avoidance for multiple resources using banker's algorithm. 8
- b) What is "Race Condition"? Illustrate its effect on the execution of a system with an example? 7
- a) Give the structure of a kernel? How kernel mode and user mode are different? 7
- b) Five batch jobs A through E, arrive at a computer center at almost same time. They have estimated running times of 10, 6, 2, 4 and 8 minutes. Their priorities are 3.5,2.4 and 1 respectively with 5 being the highest priority. For each of the scheduling algorithms determine the mean process turn around time. Ignore process switching overhead
 - i) Round robin scheduling (quantum time = 2 minutes)
 - ii) Priority scheduling
 - iii) Shortest job first
- ii) Consider the following page reference strings: 1, 3, 5, 3, 7, 1, 5, 3, 1, 2, 7, 3, 7, 6, 3, 4, 1, 8. How many page faults would occur for each of the following page replacement algorithms assuming 4 pages a frames?
 - i. LRU page replacement
 - ii. FIFO page replacement
 - iii. Optimal page replacement

- b) What is swapping? Given Memory partition of 100k, 500k, 200k, 300k and 600k in order. How would first fit algorithm place processes of 212k, 417k, 112k and 426k in order? 8
- 5. a) The disk track reques are 123,250,298,120,13,300 and 220. Assume that the last request is at track 150 and the head is moving towards track 0. Find out the local seek time for each of the link scheduling algorithm below. 7
 - i) SSF
 - ii) C-SCAN
 - iii) FIFO
- b) Explain different file system implementation methods. 8
- 6. a) List the goals of distributed operating system and explain in detail. How does RPC communicate in distributed environment? 8
- b) Describe the use and importance of autoexec.bat and config.sys files in MS-DOS. 7
- 7. Write short notes on: (Any two) 2×5
 - a) Parallel OS.
 - b) Ostrich Algorithm
 - c) DMA

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: 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.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define processes. Explain different operating system structures. 8
- b) What is process control block? Describe the fields in a process control block (PCB) with diagram. 7
- a) Explain Producer Consumer problem in process synchronization and give solutions to it using semaphores. 7
- b) Describe Dining Philosophers Problem and show how deadlock occurs in it. Provide the solution to deadlock in Dining Philosophers problem. 8
- a) List out the conditions for deadlock. Explain deadlock modelling using resource allocation graphs for multiple type Resources. 8
- b) What is context switching? Explain it with an appropriate diagram. 7
- a) Consider the following set of processes that arrive at time 0, with the length of the CPU burst given in milliseconds. Construct the Gantt chart and calculate average waiting time. 8

Process	Burst Time	Priority
P1	32	3
P2	7	6
P3	6	2
P4	21	1
P5	6	4
P6	9	5

- i. HRRN
- ii. RR (Quantum = 5)
- iii. Priority Scheduling
- iv. Shortest Job First (Preemptive)
- b) List pros and cons of distributed system over centralized system. Explain remote procedure call (RPC). 7
- 5. a) What is fragmentation? What are its types? How can the problems of fragmentation be solved? 7
- b) Consider the following page reference strings 7,0,1,2,0,3,0,4,2,4,0,3,2. How many page faults would occur for each of the following page replacement algorithm assuming 3 pages a frame? In each case calculate fault ratio.
 - i. Second Chance Page replacement algorithm
 - ii. NRU
 - iii. Optimal Page replacement algorithm.
- 6. a) Suppose a disk drive has 200 tracks, numbered 0 to 199. The current position of the R/W head is at track 60 and the previous request was at track 45. The sequence of pending requests is 43,72, 150, 48, 85, 170, 190, 130. Starting from current position what is the total number of track movements (distance) for the following disk scheduling algorithms.
 - i. SSTF ii. SCAN iii. C-LOOK
- b) List the various file operations. Explain the I-nodes method of File allocation. 7
- 7. Write short notes on: (Any two) 2×5
 - a) File Systems and Disk management in LINUX
 - b) Security in Windows 2000.
 - c) RAID.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Operating System

Semester : Spring

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.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define operating system. Explain the fundamental differences between monolithic and layered structure of operating system. 8
- b) For what purpose semaphores are used? Give solution to producer-consumer problem using semaphores. 7
2. a) Define PCB. How do processes transition between different states and what triggers these transitions? Illustrate with neat diagram. 8
- b) What are different types of kernels? Explain each in detail. 7
3. a) Consider the following set of processes with the length of the CPU burst given in milliseconds. Construct the Gantt chart and calculate average waiting time and turnaround time. Also explain which one is the best algorithm. 8

Process	Arrival Time	Burst Time	Priority
P1	0	9	2
P2	4	4	1
P3	10	3	3
P4	0	6	4

- i) HRRN
 - ii) RR (Quantum = 1ms)
 - iii) Priority Scheduling (1 higher priority)
 - iv) Shortest Job First (pre-emptive)
- b) Examine the role of virtual memory. How does the Operating system map virtual address to physical address? Explain with example. 7

4. a) Consider the following page reference strings: 9, 3, 4, 5, 3, 9, 6, 7, 3, 9, 3, 4, 8, 7, 4, 3, 9, 3, 4, 7. How many page faults would occur for each of the following page replacement algorithms assuming 3 pages a frame? In each case calculate fault ratio
 - i) Second Chance page replacement
 - ii) LRU page replacement
 - iii) FIFO page replacement
- b) Define context switching Explain context switching by demonstrating a diagram that show how CPU switches from one process to another. 7
5. a) Given a disk drive with 400 cylinders. The driver is currently serving a request at cylinder 162 and previous request was at cylinder 128. The queue of pending request in FIFO order is: 90, 150, 386, 94, 187, 48, 278, 202, 188, and 135. Starting from the current head position what is the total distance in cylinders that the disk to satisfy all the pending request for each of the following disk scheduling algorithms?
 - v) FCFS
 - vi) SSTF
 - vii) SCAN
 - viii) C-Look
- b) How file naming is done? Discuss different file allocation methods. 7
6. a) What are advantages of distributed system? Discuss RPC technique in Distributed System. 7
- b) How process management is done in UNIX or Linux? Explain. Why is Linux considered more secured than other operating system? 8
7. Write short notes on: (Any two) 2x5
 - a) DMA.
 - b) Windows 2000.
 - c) The Shell.