

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Operating Systems (CT 612)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. How does operating system provide a beautiful interface to user? Why Exo-Kernel doesn't require Re-mapping of resources? Is layered structure of operating system is better than monolithic structure? Explain. [3+3+3]
2. Why threads are called light weight process? Consider the following set of processes, with length of the CPU burst time given in milliseconds. [2+8]

Process	Burst time	Priority
P1	0	3
P2	2	6
P3	4	4
P4	6	5
P5	8	2

All the processes are assumed to have arrived in order all at time 0.

- (i) Draw Gantt Chart Using FCFS, SJF scheduling algorithm.
- (ii) Find average turnaround time and waiting time for each scheduling algorithm.
3. Explain about Lock variable for achieving Mutual Exclusion. Explain the types of semaphore along with the major operations of semaphore with a simple Pseudocode. [2+5]
4. Explain how a logical address is mapped to a physical address in paging. How is virtual memory management done? [4+2]
5. How many pages fault for the following given reference string for four-page frames 0,9,0,1,8,1,8,7,8,7,1,2,8,2,7,8,2,2,8,3. [7]
 - a) LRU
 - b) FIFO
 - c) Optimal page
6. Explain I-node approach of files implementation with its advantages and disadvantages. [5]
7. Consider a disk drive having 100 cylinders. The head is currently serving request at cylinder 43 and the previous request was at 56. The queue of pending request is 86,70,13,74,48,9,22,50,30. Starting from current head position, what is total head movement (in cylinders) to service the pending requests of each of following disk arm scheduling algorithms. [6]
 - a) FCFS
 - b) SSTF
 - c) SCAN
 - d) LOOK

8. Explain the resource allocation graph with an example. Consider a system with 4 concurrent processes (P1, P2, P3, P4) and three resource types A, B, and C with total instances 7, 10, and 10 respectively. The allocation and maximum claim at state t_0 is: [2+8]

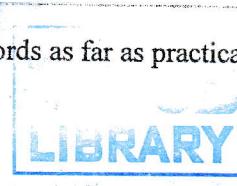
Process	Allocation			Maximum Claim		
	A	B	C	A	B	C
P1	1	2	0	3	5	0
P2	3	0	2	5	0	5
P3	1	2	2	2	2	5
P4	0	4	0	0	10	2

- a) What is the total number of available resources?
b) What will be the need matrix?
c) Is the system safe? If so, show the safe sequence.
9. What do you mean by ACL? How is it different from the capabilities list? How does Caesar Cipher convert plain text to ciphertext? [2+2+4]
10. What are the roles of a system administrator? How is a special user different from a general user? Explain. [4+2]
11. Write short notes on: (Any Two) [2×3]
- a) Compaction
b) Thrashing
c) Belady's anomaly

Exam.		Back	
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Operating Systems (CT 612)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. Why operating system evolve over long periods of time? Justify how OS act as resource manager. [1+3]

2. Explain fork() and spawn() system calls in the OS. Schedule the following set of process according to Round-Robin scheduling algorithm with Quantum time = 4 ms and calculate the average waiting time and average Turn-around time, throughput and CPU utilization. [3+5]

Process	Arrival time (ms)	CPU time (ms)
A	0	12
B	2	8
C	5	7
D	10	9

3. Why do we organize disk as RAID? Suppose a disk drive with 150 cylinder numbered from 0-149. The drive is currently serving a request at 35 and the previous request is at disk 55. The queue of pending request is 98, 103, 38, 122, 10, 128, 65, 75. Starting from the current head position, Calculate the total head moment (in cylinder) that the disk arm moves to satisfy all the pending request for SSF, SCAN, and LOOK Disk Arm Scheduling Algorithm. [2+6]

4. a) Explain first fit, Next fit memory allocation algorithm with an example. [5]

b) How semaphore is used in process synchronization? Explain how semaphore is best solution for producer consumer problem with pseudo-code of both producer and consumer process. [1+7]

5. What is file attribute? List the file system performance indicator. Explain the file allocation methods with its advantages and disadvantages. [1+2+5]

6. What are the differences between fixed partitioning and variable partitioning system of memory for multiprogramming? Given reference to the following pages by a program:
 0,9,0,1,8,1,8,7,8,7,1,2,8,2,7,8,2,3,8,3

How many page faults will occur if the program has 4 frames for Optimal Page Replacement Algorithm? [3+5]

7. Explain necessary conditions for deadlock. Consider the following snapshot of a system
(P = Process, R = Resource):

[2+6]

Available				
	RA	RB	RC	RD
P0	3	2	1	4
P1	0	2	5	2
P2	5	1	0	5
P3	1	5	3	0
P4	3	0	3	3

	Maximum Demand			
	RA	RB	RC	RD
P0	3	2	1	4
P1	0	2	5	2
P2	5	1	0	5
P3	1	5	3	0
P4	3	0	3	3

	Current Allocation			
	RA	RB	RC	RD
P0	1	0	1	1
P1	0	1	2	1
P2	4	0	0	3
P3	1	2	1	0
P4	1	0	3	0

By using Bankers algorithm, Calculate the need matrix. Is the system safe? If safe find safe order of process.

8. Describe the role and responsibilities of system administrator to keep the system updated and efficient. Explain with examples.

[6]

9. Define ACL. Write the type of security breach in following attack case? Also suggest a solution in each to prevent the attack.

[2+2+2+2]

"Ramesh found that Nirmal's Facebook was login in Computer Lab. He then changed the personal information and login credentials of Nirmal's account."

10. Write short notes on:

[3x3]

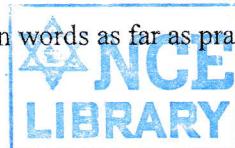
- a) Ostrich algorithm
- b) Shell programming
- c) Process control Block

TRIBHUVAN UNIVERSITY
 INSTITUTE OF ENGINEERING
Examination Control Division
 2080 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Operating Systems (CT 612)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. What is an Operating system? Explain the statement “ operating system acts as a Broker between hardware and application program”. [5]
2. What is priority of a process? Why do we need it? Explain. Make a schedule for the processes mentioned in the table below as per Shortest Remaining Time First (SRTF) algorithm. Also calculate average turnaround time and average waiting time, throughout and CPU utilization. [2+6]

Process	Burst Time	Arrival Time	Priority
P ₁	3	0	3
P ₂	6	1	5
P ₃	1	2	2
P ₄	4	3	1
P ₅	2	4	4

3. What are the principles of I/O software? Suppose that a disk drive has 100 cylinders, numbered 0 to 99. The drive is currently serving a request at cylinder 43 and previous request was at cylinder 25. The queue of pending request, in FIFO order is: 86,70,13,74,48,9,22,50,30. Produce the schedules to satisfy all the pending requests for each of the following disk scheduling algorithms? [2+6]
 - a) FCFS
 - b) C-SCAN
4. a) Explain Best fit and Worst fit memory allocation algorithm with an example. [5]
 - b) What is the need process synchronization? How can the semaphore solve the reader-writer problem? Explain with respective pseudo-code of both reader and writer process. [2+6]
5. What is directory organization in files? Explain its types. [8]
6. What is Belady's anomaly in F1F0? Consider the following page reference strings; 2, 3, 4, 2, 1, 3, 5, 4, 3, 1, 5, 3, 4, 5, 0, 1, 4, 2. Find how many page fault occur according to OPTIMAL, LRU (least recently used) and LFU (least frequently used) page replacement algorithm assuming 3 page frames. [1+7]

7. Consider a system with 5 concurrent processes (P0, P1, P2, P3, P4) and 4 resource types (R0, R1, R2, R3). The number of instances of each resource type in the system are 6,4,4,2 respectively. Allocation table and Maximum claim table are as follows: [8]

Maximum claim

	R0	R1	R2	R3
P0	2	0	1	1
P1	1	1	0	0
P2	1	1	0	0
P3	1	0	1	0
P4	0	1	0	1

Allocation

	R0	R1	R2	R3
P0	3	2	1	1
P1	1	2	0	2
P2	1	1	2	0
P3	3	2	1	0
P4	2	1	0	1

- a) Calculate Need matrix as per Banker's algorithm.
 - b) Is the state safe? If so, show the safe execution of the processes.
8. What are the roles and responsibilities of system administrator? [6]
9. Explain the types of Network Attacks? What is ACL? Why 'HASH' function is called Message Digestor? [2+2+2]
10. Write short notes on: [3x3]
- a) Thrashing
 - b) Virtual Machine
 - c) User level thread vs Kernel- level thread.

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam. Level	BE	Back Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Operating System (CT 612)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. a) Explain OS as an Extended Machine. Differentiate between Monolithic Kernel and Micro-Kernel. [2+4]
- b) Explain operating system as a virtual Machine. [4]
2. a) Differentiate between Preemptive and Non-Preemptive Scheduling. Apply MLQ scheduling for following set of processes of two queues Q1 and Q2 where Priority of Q1 is greater than that of Q2 and Q1 uses Round Robin (Time Quantum = 2) and Q2 uses FCFS.

Process	AT	BT	Queue Number
P1	0	5	1
P2	2	12	2
P3	5	3	1
P4	10	6	1

- Construct Gantt –Chart and compute average TAT for above scenario. [2+4]
- b) What is multithreading? Explain five state process model with figure. [4]
 3. a) Why process need to be synchronized? Explain Peterson's Solution in mutual exclusion. [2+3]
 - b) What is Semaphore? How can Producer Consumer problem be solved using Semaphore? Explain. [1+4]
 4. a) Why multilevel paging is required? [2]
 - b) Consider the following page reference string: 5,0,2,1,0,3,0,2,4,3,0,3,2,1,3,0,1,5
Calculate page hit percentage. How many page faults would occur for the FIFO, Optimal, LFU and LRU replacement algorithms having four frames? Remember all frames are initially empty, so your first unique page will cost one fault each. [8]
 5. What are the different methods for allocating disk space for file? Explain free space management techniques. [3+7]
 6. What are the functions of device independent I/Q software? Suppose that a disk has 5000 cylinders, numbered from 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests in FIFO order is:

86,1470,913,1774,948,1509,1022,1750,130

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 FCFS, SSTF, C-SCAN and C-LOOK Algorithm? [2+8]

7. Explain Coffman conditions for deadlock. Consider the following snapshot

Processes	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			

Is the state safe? If so, show the safe execution of processes.

[3+7]

8. Write short notes on:

[4×2.5]

- a) Cryptography
- b) Access Control List
- c) Roles of System Admin
- d) AWK Tool

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEI	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Operating systems (CT 612)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



1. a) Why is the process table needed in a timesharing system? Is it also needed in personal computer systems running UNIX or Windows with a single user? [6]
- b) Distinguish between Shell and Kernel. [4]
2. a) What are the advantages and disadvantages of implementing threads in user space? [4]
- b) Let us consider five processes with given arrival time and length of the CPU burst given in milliseconds. [6]

Process	Arrival time	CPU time
P1	0	9
P2	1	5
P3	2	2
P4	3	6
P5	4	8

Calculate the turnaround time and waiting time for all processes applying First Come First Serve, Shortest Job first and Round Robin (time quantum = 3) algorithms.

3. Define race condition. What are the requirements of mutual exclusion? How can you achieve mutual exclusion using Peterson's Solution? Explain with pseudo code. [2+2+6]
4. a) Differentiate between Compaction and Coalescing technique. [4]
- b) Consider a swapping system in which memory consists of the following hole sizes in memory order: 10 MB, 4 MB, 20 MB, 18 MB, 7 MB, 9 MB, 12 MB and 15 MB. Which hole is taken for successive segment requests of [6]
 - (i) 12 MB
 - (ii) 10 MB
 - (iii) 9 MB
for first fit? Now repeat the question for best fit and worse fit.
5. a) Explain various ways of implementing file system. [6]
- b) How do you measure the file system performance and how it can be improved? [4]
6. What do you mean by RAID? Suppose a disk with 200 cylinders numbered from 0-199. The drive is currently serving a request at 45 and previous request was at 125. The queue of pending request is 105, 178, 23, 67, 43, 78, 167, 56 and 98. Starting from current head position, calculate the total head movement (in cylinder) that the disk arm moves to satisfy all pending request for SSTF, SCAN, LOOK and C-SCAN disk scheduling algorithm. [2+8]

7. Explain in detail how can detect deadlock in operating system. Consider the following system with resources A, B, C, D and process P0 to P4. Is the state safe? If so, show the safe execution of processes.

[3+7]

Process	Max				Allocation				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	6	0	1	2	4	0	0	1	3	2	1	1
P1	1	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				

8. Write short notes on Caesar Cipher and Access Control Lists.

[3+3]

9. What is the significance of system Administration? Describe the roles and responsibilities of system administrator in Insurance Company.

[4]
