Subject: -Operating System (CT 656)

✓ 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 the role of system call in an operating system? Write down the major differences between following types of operating system. [2+8]
   a) Batch system
   b) Interactive system
   c) Real time system
   d) Time sharing system

2. State 5- State process model. From the given following information: [2+8]

Process	Burst Time	priority
p1	10	3
p2	1	1
p3	2	3
p4	1	4
p5	2	2

   Assume the processes arrived in the order p_1, p_2, p_3, p_4 and p_5 all time 0, priority 1 as highest and 4 as lowest.

   a) Draw the gantt chart
   b) Calculate average waiting time and average turnaround time for the following scheduling algorithm.
      (i) Round robin (quantum= 1)
      (ii) priority preemptive
      (iii) preemptive SJF
      (iv) FCFS

3. What is critical section problem? Why must the executing the critical section be mutually exclusive? Describe how race condition occurs in producer- consumer problem and use semaphore to solve it. [2+2+6]

4. Define page fault and demand paging. Consider logical address spaces of eight pages of 1024 words, each mapped onto a physical memory of 32 frames then, [4+6]
   a) How many bits are in logical address and physical address?
   b) How paging will be done?

5. What is the role of file system? How can files be Implemented? List any three of them with advantages and disadvantages of each. [2+6]

6. 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   [2+6]

Produce the schedules to satisfy all the pending requests for each of the following disk scheduling algorithms: 1. FCFS   2. C-SCAN   3. SSTF

7. Write four conditions for deadlock. Consider the following snapshot of a system: [2+6]

Process	Allocation			Maximum Claim		
	A	B	C	A	B	C
P0	0	1	0	7	5	3
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

Let the available number of resources be given by available vectors as (3,3,2). Use Bankers algorithm to claim that the system is in safe state and show the safe sequence.

8. Describe, how access control list is used? What are the roles of system administrator for change management?   [4+4]

9. Write short notes on (Any Two):   [2×4]
    i)   Public key cryptography
    ii) Resource allocation graph
    iii) Process Vs thread

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Poush

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

Subject: - Operating Systems (CT 656)

✓ 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. Explain how operating system creates abstraction to the user? Explain with an example of system call and its working mechanism. Define multiprogramming OS and real time OS. [6+4]

2. a) Discuss two state and five state process model. [4]

   b) Schedule the following set of processes using RR (3), HRRN and SRTN algorithm and calculate ATAT and AWT. [6]

Process	Arrival Time (ms)	CPU Time (ms)
A	1	8
B	4	6
C	6	4
D	2	7
E	3	9

3. a) Define race condition and critical section. Why process needs to be synchronized? Give example. [4]

   b) Explain TSL algorithm and Peterson's algorithm. [6]

4. Define demand paging and thrashing. Calculate the number of page faults according to optimal and LRU algorithm with the following page sequence. [Assume 3 page frames]. [4+6]

   2, 4, 1, 2, 3, 5, 6, 7, 8, 6, 8, 5, 6, 4, 3, 2, 1, 0, 6

5. Discuss contiguous and linked list implementation of file. What is file system layout? Explain with figure. [6+4]

6. Define deadlock and list the deadlock handling strategies. Consider the following snapshot of the system. [3+7]

Process	Allocation				Maximum				Available			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
A	0	0	1	2	0	0	1	2	1	5	2	0
B	1	0	0	0	1	7	5	0				
C	1	3	5	4	2	3	5	6				
D	0	6	3	2	0	6	5	2				
E	0	0	1	4	0	6	5	6				

7. List the goals of I/O software. Explain structured I/O software layers. [4+4]

8. What is access control list and protection mechanism? How OS manages these to provide security? Explain. [6]

9. Suppose you are recruited as a system administrator in Nepal Telecom, an internet service provider. Mention your roles and responsibilities to provide a secure and reliable service to the users. [6]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Baishakh

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

Subject: - Operating System (CT 656)

✓ 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. Define Operating System. Explain Interactive and Real time OS with statement of typical characteristics examples. [1+3]

2. Explain why exo-kernel doesnot require re-mapping of resources? Is layered structure of operating system is better than monolithic structure? Explain. [2+3]

3. What do you mean by threads? Write the advantages and disadvantages of Kernel level thread and User level thread. [2+2]

4. Let us consider following processes with given arrival time and length of the CPU burst given in milliseconds. [6]

Process	Arrival Time	Burst Time
P1	0	4
P2	1	5
P3	2	2
P4	3	1
P5	4	6
P6	6	3

   a) Draw the Gantt Chart showing the execution for FCFS, SRTN and RR (Quantum = 2)
   b) Which algorithm results in Maximum Average Turnaround Time?

5. What is 'Mutual Exclusion' problem in IPC? Explain the "Dinning Philosopher problem", when such problem happens in computer system? Present the solution with pseudocode example. [2+2+6]

6. What is 'virtual memory'? Differentiate between paging and segmentation techniques. Explain TLB and exact working of TLB for paging with illustration of sample pages accessing scenario. [2+3+5]

7. Explain file system layout in detail. How file system can be implemented by linked list using index? Write its advantages and disadvantages. [3+3]

8. Suppose the disk requests comes in the order of request as 82, 170, 43, 160, 24, 16, 190 and current position of Read/Write head is 50. If a seek takes 6msec/cylinder. How much seek and seek time is needed for: FCFS, SSTF, SCAN, and C-LOOK disk arm scheduling algorithm. [10]

9. What do mean by symmetric cryptosystem? Explain Caesar cipher with suitable example. How protection domain is implemented in security? [2+3+2]

10. Compare between system policies and access control on security implementation. How does ACL work? Illustrate. [4+4]

[2×5]

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

Subject: - Operating System *(CT656)*

✓ 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. Differentiate between I/O bound process and CPU bound process? What is process scheduling? Why do we need thread? [2+3+3]

2. Define process in OS and explain possible states. Consider the following set of processes, with the length of the CPU burst time in millisecond. The processes are assumed to have arrived in the order P1, P2, P3, P4, P5 all at time 0. [Lowest Number being Highest Priority] [8]

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	5
P4	1	4
P5	5	2

Draw Gantt chart illustrating priority and RR (quantum = 1) scheduling. Also find average waiting time and average turn-around time for each of the algorithms.

3. Consider a disk queue with requests for I/O to blocks on cylinders 23, 89, 132, 42, 187. Assume disk head initially at 100 and a seek takes 6m/sec/cylinder. How much seek is needed for FCFS, SSF and SCAN disk arm scheduling algorithms. [8]

4. Explain inode approach of file system implementation with its advantages and disadvantages. [8]

5. What are the differences between fixed partitioning and variable partitioning system of memory for multiprogramming? [3+5]

   Given reference to the following pages by a program:

   0,9,0,1,8,1,8,7,8,7,1,2,8,2,7,8,2,2,8,3

   How many page faults will occur if the program has 4 frames for Optimal Page Replacement algorithm?

6. Explain private and public key used in asymmetric cryptography. What is the use of ACL? [5+3]

7. What is critical section problem? Why must the executing the critical section be mutually exclusive? Describe how semaphore can be used to solve the critical section problem. [2+2+4]

8. What is the significance of system administration? Describe the role and responsibilities of system administrator to keep the system updated and efficient. Explain with an example. [3+5]

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

Allocation

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

	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

10. Write short notes: [2×4]

   i) Thrashing

   ii) Shell programming

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

Subject: - Operating System *(CT656)*

✓ 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 multiprogramming, multiprocessing and distributed operating system. [6]

   b) Explain the virtual machine structure. What are the benefits over other operating system structure? [2+2]

2. a) Difference between process and thread. Explain how thread based execution minimizes context switching problem of process based execution. [2+2]

   b) Suppose 5 processes are submitted at time 0.

Process	A	B	C	D	E
Burst Time	35	10	15	5	20
Priority	3	2	4	5	1

   Show the execution timeline of the processes using Gantt Chart for FCFS, SJF and Round Robin (q=5). Also calculate mean turnaround time in each case. [6]

3. a) What is race condition? Explain how Sleep() and Wakeup() solution is better than busy waiting solution for critical section problem. [2+3]

   b) What is TSL? Why it is used? Explain the major operations of semaphore with a simple implementation as a class. [5]

4. What is thrashing? Consider the following page-reference storing-

   7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. How many page faults woud occur for the following page replacement algorithms, assuming 3 frames:-

   a) FIFO   b) Optimal   c) LRU   d) LFU [2+8]

5. Discuss various file allocation and access methods. Compare their advantages and disadvantages. [4+6]

6. A disk drive has 50 cylinders, numbered 0 to 49. The drive is currently serving a request at cylinder 15, and the queue of pending requests, in FIFO order is 4, 40, 11, 35, 7, 14. What is the total distance that the disk arm moves for the following algorithms:-

   a) FCFS   b) SSTF   c) SCAN   d) LOOK   e) C-SCAN [10]

7. What is Deadlock and indefinite Postponement? Explain the necessary conditions for deadlock and Explain how deadlock can be prevented? A system has 2 process and 3 resources. Each process need maximum of two resources, IS deadlock possible? Explain. [1+1+3+3+2]

8. How authentication is an essential mechanism for maintaining security? Explain. [4]

9. Write short notes on: [2×3]

   a) Caesar Cipher
   b) Administration tasks

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Exam.	**New Back (2066 & Later Batch)**		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System *(CT565)*

✓ 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 Operating system is termed as virtual machine? Briefly mention the function of Operating system. [5]

   b) What is System Call? Explain in brief about the given architecture of operating system. [2+3]

      i) Monolithic Architecture

      ii) Virtual Machine

2. a) Define process. Describe the various states of process. How significant is the process hierarchy? [1+2+2]

   b) Make a schedule as per Rate Monotonic (RM) algorithm for the following set of real time tasks: [5]

Task, T	Period, P	Execution time, E	Phase,∅
T_1	4	1	0
T_2	5	2	0
T_3	20	5	0

3. Define race condition. What are the requirements of mutual exclusion? Solve producer consumer problem using semaphore and message passing. [2+2+6]

4. Under what circumstances do page fault occur? Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6 how many page faults would occur for the LRU replacement, FIFO replacement and optimal replacement algorithms by assuming three frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each. [4+6]

5. Suppose a disk drive with 200 cylinders numbered from 0 to 199. The drive is currently serving a request at 53. The queue of pending request is 98, 183, 37, 122, 14, 124, 65, 67. Starting from the current head position, Calculate total head movement (in cylinder) that the disk arm moves to satisfy all the pending request for FCFS, SSF and SCAN disk scheduling algorithm. [6]

6. What is File Attribute? Write the difference between Single level directory system and Hierarchial directory system. Explain how operating system manages free blocks of Secondary storage. [1+3+6]

7. List four essential conditions for deadlock. Explain each of them briefly. What would be necessary (in operating system) to prevent the deadlock? How deadlock is recovered? Explain. [10]

8. Write short notes on: [3.5×4]

   i) Protection Domain

   ii) Cryptography

   iii) System administration

   iv) Dining philosopher problem

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

Subject: - Operating System *(CT656)*

✓ 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) What are the primary purposes of an operating system? Explain. Why should the operating system prevent users from accessing the boot sector? [3+2]

   b) Explain in brief any four types of OS. [5]

2. Assume the system having two processors of same configuration, schedule the following set of processes according to preemptive priority and round robin algorithm (Time quantum = 3) and calculate average waiting time and average turnaround time. [5+5]

Process	Arrive Time	CPU Time (ms)	priority
A	0	12	1
B	2	8	2
C	5	7	4
D	3	9	3
E	4	6	2
F	8	5	1
G	7	7	3
H	3	4	4
I	4	2	3

3. a) Explain Critical Section problem. Why is it important for a thread to execute a critical section as quickly as possible? [5]

   b) Define Semaphore and explain the major operations in semaphore including pseudocode. [5]

4. a) Differentiate compaction and Coalescing technique. How logical address is mapped to physical address by Paging Technique? Explain with suitable example. [2+3]

   b) With an example, show that FIFO page replacement algorithm suffers from Belady's anomaly. What is thrashing? [3+2]

5. Briefly mention the structured I/O software with suitable diagram. Compare the throughput (overall performance) of SCAN with SSTF [6]

6. a) In what ways is file system management similar to virtual memory management? What are the advantages and disadvantages of a contiguous file allocation scheme? Which file organization technique is most appropriate for tape storage? Why? [3+3]

   b) List the file system performance indicators with brief explanation. [4]

7. What is the difference between deadlock and indefinite postponement? 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: [3+7]

	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

Maximum claim

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

8. Write short notes on: [3.5×4]

   i) Duties and responsibilities of system administration
   ii) Types of security Attack
   iii) Principle of I/O Software
   iv) UNIX file system

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

Subject: - Operating System *(CT656)*

✓ 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 the Virtual Machine Structure. What are the benefits over other operating system structure? [2+2]

   b) What is operating system? Briefly explain the function of operating system. [1+4]

2. a) Differentiate between process and thread. Explain the advantages of multithreading. [2+2]

   b) Schedule the following set of processes according to HRRN and Round Robin algorithm (Time quantum=4) and calculate average waiting time and average turnaround time. [5]

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

3. What is TSL instruction? Why it is used? Solve producer-consumer problem using monitors. [1+2+7]

4. Define page fault and demand paging. Consider a paged memory system with eight pages of 8KB page size each and 16 page frames in memory. Using the given page table, compute the physical address for the logical address 18325. [3+6]

7	10
6	4
5	0
4	7
3	13
2	11
1	14
0	5

5. What is file system layout? Explain how operating system manages free blocks of secondary storage. [3+7]

6. What is disc scheduling? Explain details about the device independent I/O software with example. [3+6]

7. What is deadlock? Explain the essential condition for deadlock. How you detect deadlock? Explain with example. [2+4+4]

8. Explain the types of attacks. Explain, how can you implement security and protection on all components of a system. [3+6]

9. What is system administration? How is a special user different from a general user? Explain. [2+3]

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8

Exam.		Regular / Back	
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System (CT656)

✓ 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 the role of supervise call in an operating system? Write down the major differences between following types of operating system.   [2+8]

   a) Batch System
   b) Interactive System
   c) Real Time System
   d) Time Sharing System

2. Define Context Switching. Discuss 5-state model of process. Schedule the following set of process according to multilevel feedback queue scheduling algorithm and compute AWT and ATAT.   [2+3+5]

Process	P1	P2	P3	P4
Arrival Time	0	12	25	32
CPU Burst (ms)	25	18	4	10

   Assume that there are three ready queues Q1, Q2 and Q3. The CPU time slice for Q1 and Q2 is 5 ms and 10 ms respectively and processes are scheduled on FCFS basis in Q3.

3. Define race condition with example. Explain Peterson's Algorithm.   [3+7]

4. Differentiate compaction and coalescing techniques. How logical address is mapped to real physical address by paging technique? Explain with suitable example. What is the role of TLB?   [4+4+2]

5. Describe different file allocation methods. Explain free disk space management with example?   [6+4]

6. Consider a system with 5 processes P_0 through P_4 and three resources types A, B, C. Resources types A has 7 instances, B has 2 and C has 6 instances. Suppose at t0 time we have following state: [10]

Process	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	0	0	0	0	0	0
P1	2	0	0	2	0	2			
P2	3	0	3	0	0	0			
P3	2	1	1	1	0	0			
P4	0	0	2	0	0	2			

   a) Is the given system in deadlock state?
   b) Suppose P2 makes an additional request (0, 0, 1) what will be the effect of this request to the system?

7. A disk with 1000 cylinders, numbered 0 to 999, compute the number of tracks the disk arm must move to satisfy all the requests in the disk queue. Assume the last request serviced was at track 345 and the head is moving towards track 0 (zero). The queue in FIFO order contains request for the following tracks: [10]

123, 874, 693, 475, 105, 376

Perform the computation for the following scheduling algorithms:

a) FIFO
b) SSTF
c) SCAN

8. Write short notes on: [5+5]

a) Types of network security attack
b) Duties and responsibilities of system administrator

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Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System (EG682CT)

✓ 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 do you understand by firmware? Can you relate with operating system? Are there any linkages among hardware, software, firmware and operating system? [10]

2. What makes the message passing IPC as one among the best methods of IPC implementation? Explain with pseudo0code details. [10]

3. Prepare a comparative note on the fixed and variable partition multiprogramming techniques for real memory management. [10]

4. a) What is paging? How does it work? [3]

   b) Explain the differences in the degree to which (i) First Come First Serve (ii) Round Robin and (iii) Multi level queues, scheduling algorithms discriminate in favor of short processes. [7]

5. Consider a system consisting of m resource of the same type, being shared by n processes. Resources can be requested and released by processes only one at a time. Show that the system is deadlock free if the following two conditions hold: [10]

   a) The maximum need of each process is between 1 and m resources.

   b) The sum of all maximum needs is less than m + n.

6. a) What is a device controller? What is a device driver? How do they relieve programmer? Explain with an example of any I/O device. [7]

   b) Explain the implementation of process. [3]

7. What is bootstrapping? Explain the working principle of a typical assembler. What are the different records present within object program? [10]

8. Compare the followings: [2.5×4]

   a) Semaphore Vs Monitor
   b) Latency time Vs seek time
   c) Coalescing Vs Compaction
   d) Real Memory Vs Virtual memory

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Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System (CT656)

✓ 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. Explain operating system as an extended machine? Distinguish between Kernel and Micro-Kernel. Explain the purpose of system call. [2+3+3]

2. For the process listed in following table, what is the average turnaround time using: [10]

    (a) FCFS (b) RR (quantum=4) (c) SJF (d) SRT (e) HRRN

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

3. Define critical section and mutual exclusion with respect to multiple-process system. Solve producer and consumer problem using semaphore. [3+5]

4. What is page fault? 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. How many page faults would occur for the FIFO, Optimal, LFU and LRU replacement algorithms having five frames? Remember all frames are initially empty, so your first unique page will cost one fault each. [2+8]

5. What are the different methods for allocating disk space for file? Explain free space management techniques. [2+6]

6. 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: [10]

    86, 70, 13, 74, 48, 9, 22, 50, 30

    Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms?

    a) First-come, First served
    b) Shortest Seek Time First
    c) Look
    d) C-Scan
    e) Scan

7. What is deadlock? How it occurs? Explain various deadlock avoidance methods with examples. [2+2+6]

8. What are the roles of system administrators for an organization? How can you increase operating system performance if you are selected as a system administrator? [4+4]

9. Write short notes on: (any two) [4+4]

    a) Information security model
    b) Security attack

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Exam.	**Regular (2066 & Later Batch)**		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System *(CT656)*

✓ 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 operating system creates abstraction? Explain with reference to OS as an extended machine. Define system call and explain its working mechanism with suitable example.   [5+5]

2. What is Process Control Block? Explain scheduling algorithms in interactive system.   [2+8]

3. What are conditions to get mutual exclusion? Define semaphore and solve the producer-consumer problem using semaphore.   [2+8]

4. What is page fault? Assume that a virtual memory of size 64K is mapped to physical memory of 32K with page frame 4K. Initially, pages are mapped as: 0,1,2,3,4,5,9,11 correspond to 2,1,6,0,4,3,5,7 respectively. Calculate outgoing physical address for incoming virtual address 20482 with necessary mapping diagrams.   [2+8]

5. How file system can be implemented using linked list? Explain impact of block size selection on data rate and disk space utilization with necessary diagram and illustration.   [4+6]

6. Explain working mechanism of device driver? Suppose a disk drive with 200 cylinders, numbered from 0 to 199. The drive is currently serving a request at cylinder 53. The queue of pending requests is: 98, 183, 37, 122, 14, 124, 65, 67. Starting from the current head position, calculate total distances (in cylinders) that the disk arm moves to satisfy all a pending requests for FCFS, SSF and SCAN disk scheduling algorithms.   [4+6]

7. Write four conditions for deadlock. A system has four processes P1, P2, P3, P4 and three resources R1, R2, R3 with existing resource E= (15 9 5). After following allocation, resource available becomes A = (3 2 0). Use Banker's algorithm to test whether the given state is safe or not. If it is safe state, show the sequence of execution of processes.   [2+8]

	Allocation			Maximum			Need		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	3	0	1	3	2	2	0	2	1
P2	5	4	1	6	8	2	1	4	1
P3	2	2	0	3	2	4	1	0	4
P4	2	1	3	4	2	3	2	1	0

8. Explain protection domain and access control list (ACL). Suppose you are employed as a system administrator of CIT, Pulchowk campus. Detail your roles and also suggest the blowing ideas to maintain secure and reliable system.   [5+5]

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

Subject: - Operating System (CT656)

✓ 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. List the essential properties for the Batch-oriented and Interactive operating system. For each of the following application which system (Batch or Interactive) is more suitable? State the reason.   [4+6]

   a) Word Processing
   b) Generating monthly bank statements
   c) Computing pi to million decimal places
   d) A flight simulator
   e) Generating mark statement by University
   f) Data acquisition from temperature sensor

2. Consider the following set of process with the length of the CPU burst time given in millisecond.   [4+4]

Process	P1	P2	P3	P4	P5
Burst time	10	1	2	1	2
Priority	3	1	3	4	2

   Assume the processes arrived in the order P1, P2, P3, P4 and P5 all at time 0, priority 1 as highest and 4 as lowest.

   a) Draw the Gantt chart for FCFS, SJF, Priority and Round Robin (Quantum = 2)
   b) Which algorithm results in the maximum average waiting time?

3. What is race condition and critical section problem? Explain all possible approaches to handle the situation "while one process is busy updating shared memory, no other process will enter its critical section and cause trouble".   [2+8]

4. Calculate Hit and Faults using various page replacement algorithm policies. (FIFO, LRU, Optimal) for the following page sequence (The page frame size is 3)   [2+6]

   2   3   5   4   2   5   7   3   8   7

5. Explain file system layout in detail. What are the major differences between file system interfaces and file system implementation?   [6+4]

6. What are the disadvantages of programmed I/O? Explained about DMA. What are the functions of device independent I/O software?   [2+2+4]

7. What is deadlock? State the necessary conditions for deadlock to occur. Give reason, why all conditions are necessary.   [10]

8. Explain the domain-object and ACL. How these mechanisms are implemented for security?   [4+4]

9. Write short notes:

   a) Roles of System Administration   [4]
   b) Shell Scripts   [4]

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Exam.	-Regular (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System *(CT656)*

✓ 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.

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	Allocation			Maximum			Need		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
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P3	2	2	0	3	2	4	1	0	4
P4	2	1	3	4	2	3	2	1	0

8. Explain protection domain and access control list (ACL). Suppose you are employed as a system administrator of CIT, Pulchowk campus. Detail your roles and also suggest the blowing ideas to maintain secure and reliable system.   [5+5]

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Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System

✓ 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 are the functions of an operating system? Explain about microkernel.   [3+5]

2. What is a monitor? Solve dining philosopher man's problem using semaphore.   [8]

3. Describe the difference between preemptive and non- preemptive scheduling algorithm. Explain about scheduling in real time.   [4+4]

4. A system that uses the Banker's Algorithm deadlock avoidance has five processes (1, 2, 3, 4 and 5) and four types of resources (A, B, C and D). There are multiple resources of each type. Is the following state safe or not? If it is, show how the processes can complete. If not, show how they can deadlock.   [8]

Process	Current loan	Max need	Current claim
	A B C D	A B C D	A B C D
1	1 0 2 0	3 2 4 2	2 2 2 2
2	0 3 1 2	3 5 1 2	3 2 0 0
3	2 4 5 1	2 7 7 5	0 3 2 4
4	3 0 0 6	5 5 0 8	2 5 0 2
5	4 2 1 3	6 2 1 4	2 0 0 1

Resources Available   Total Resources

A B C D   A B C D
3 4 0 1   . 13 13 9 13

5. What is a critical reason and race condition? What are the limitation of optimal page replacement algorithm?   [4+4]

6. What is segmentation? Suppose a machine has 48 bit virtual addresses and 32 bit physical address.   [3+5]

   a) If pages are 4KB, How many entries are in the page table?
   b) Suppose the same system has a TLB (Translation Look a side buffer) with 32 entries. Furthermore suppose that a program contains instructions that fit into one page and it sequentially reads long integer elements from an array that spans thousands of pages. How effective will the TLB for this case?

7. What is a file system layout? Explain about I- Node and file system backup.   [3+5]

8. What is a interleaving? Consider a Winchester – style hard disc with 100 cylinders, four double – sided platters and 25 sectors per track. The following is the (time – ordered) sequence of requests for disc sectors: {3518, 1846, 8924, 6672, 1590, 4126, 107, 9750, 158, 6621, 446, 11} The disc arm is currently at cylinder 10, moving towards 100. For each of SSTF, SCAN and C-SCAN, give the order in which the above requests would be served.   [2+6]

9. What is a trap door? Explain in firewalls and access control lists.   [2+6]

10. What are the goals of UNIX? Explain about NFS protocol and draw the structure of NFS.   [2+6]

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Exam.		Regular / Back	
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System

✓ 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 an operating system acts as a virtual machine? What are the different structures of an operating system? Explain in detail about context switching. [2+2+4]

2. What is the difference between process and thread? Solve Dining philosophers problem using semaphores. [3+5]

3. What is dispatcher? Schedule the following process applying highest response ratio hext scheduling algorithm. Assume P_1 is the first process [1+7]

Process No	P_1	P_2	P_3	P_4
Arrival time (sec)	1	2	4	15
Service time (sec)	10	30	20	20

   If P_4 need 2 second of service time does the sequence of schedule change?

4. Explain the algorithm for detecting dead lock for one resource of each type. Consider that the system consists of m resources of same type being shared by n process each of which need at most two resource. Explain whether the system is deadlock tree or not? [8]

5. What are the requirements of long term information storage? What is I- node? Draw the block diagram of virtual file system. [2+3+3]

6. What is paging? Consider a swapping system in which memory consists of the following hole size in memory order 10KB, 4KB, 20KB, 18KB, 7KB, 9KB, 12KB and 15KB. Which hole is taken for successive segment request of [2+6]
   a) 12KB
   b) 10KB
   c) 9KB for first fit, next fit and best fit placement strategies.

7. What is the disadvantage of programmed I/O? Explain about DMA. What are the functions of device independent I/O software? [2+4+2]

8. What are the goals of Unix system? Draw the structure of Linux kernel. [2+6]

9. What is firewall? Explain about device driver structure. [3+5]

10. Explain in detail about any one distribution of Linux system [8]

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Exam.		Regular/Back	
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ All questions carry equal marks.
✓ Assume suitable data if necessary.

1. What features does an operating system expose on top of the hardware to enhance user experience? Explain.

2. Disabling interrupts may help avoid race conditions. Explain its drawbacks as well.

3. Give an algorithm for deadlock detection for a system with multiple resources of the same kind.

4. What is the major drawback of implementing file system with linked list allocation using a table in memory? Give an implementation scheme that removes this drawback.

5. Multiprogramming systems have a considerable overhead because of process switching. Does multiprogramming indeed optimize CPU utilization? Illustrate with a genuine example.

6. Differentiate between paging and segmentation.

7. Explain in detail about the device independent I/O software.

8. What are protection domains? Compare protection domains with access control lists.

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Exam.		Regular/Back	
Level	BE	Full Marks	80
Programme	BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Operating System

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Subject: Operating Systems

✓ 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 a process? Explain different process states and process state transitions. [1+7]

2. Describe the top-down view and bottom-up view of operating system. [8]

3. What do you understand by mutual exclusion and critical section? Explain how semaphores are utilized to solve the producer consumer problem. [2+6]

4. What is processor scheduling? Explain how Shortest Job First (SJF) and multilevel queues work? Which do you thick is better and why? [1+7+2]

5. How can you eliminate waste in variable partition multiprogramming? Also explain the drawbacks of such methods. [4+4]

6. How can you manage memory using linked lists? [6]

7. What are the strategies for deadlock handling? Explain any two techniques for preventing deadlock. [2+6]

8. Explain the working principles of a general device driver. [6]

9. Differentiate between absolute and relocating loader. [6]

10. Consider a disk drive with 200 cylinders, numbered 0 to 199. A request comes in to read a block on cylinder 25. While the drive is serving the request at cylinder 25, new requests come in for cylinders in the order of 87, 146, 90, 99, 183, 15, 48, 19. Which of the disk arm scheduling algorithms among FCFS, SSF and SCAN is best for the given set of requests? Justify with calculation. [8]

11. Write short notes on: (any two) [2×2]

    a) I-nodes
    b) Cylinder skew and interleaving in disk
    c) Least Recently Used (LRU) replacement

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INSTITUTE OF ENGINEERING

Examination Control Division

2065 Kartik

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

Subject: - Operating System

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ All questions carry equal marks.
✓ Assume suitable data if necessary.

1. What is an operating system? Can you justify that an operating system acts as a resource manager?

2. Differentiate between a process and a thread. What is a process control block? Explain.

3. What is semaphore? What is its use in inter-process communication? Explain with a suitable example.

4. What is a deadlock? How can a system recover from deadlock? List all possible alternatives and also state the problems they would induce.

5. What is virtual memory? How is it possible to work on memory space larger than the actual available physical memory? Assume a virtual memory configuration with a page frame of size 2K, virtual address space of size 32k and physical address space of 16K. With a page mapping of your choice determine the actual physical address corresponding to the virtual address 0573H.

6. What are the different types of I/O software layers? What are the tasks of device independent I/O software? Explain.

7. What is file allocation table? How does it eliminate the problem in linked list allocation? Does it induce any problem?

8. What is security? What are the possible attacks from inside the system?

9. Differentiate between an absolute and a relocation loader. Explain in brief about the bootstrap loader.

10. Write short notes on any two:

   a) Real time operating system
   b) Login spoofing
   c) Kernel

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