Course Name: Operating System

Course Outcome

CO1- Understand the classification of operating system environment.
CO2- Understand the basic of process management.
CO3- Apply the concept of CPU process scheduling for the given scenarios.
CO4- Illustrate the process synchronization and concurrency process in operating system.
CO5- Analyze the occurrence of deadlock in operating system.
CO6- Describe and analyze the memory management and its allocation policies.
CO7- Understand the concepts of disk scheduling.

Printed Pages: 03 **University Roll No.** .....

Mid Term Examination, Odd Semester 2023-24

B. Tech- CSE/ EC with Minor CS/AIML/CCV/DA/CSF/IIOT, II Year III Semester

Operating System (BCSC 0004)

Time: 2 Hours **Maximum Marks: 30**

Section – A

Attempt All Questions 3 X 5 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	i) Give two reasons why caches are useful. What problems do they solve? ii) What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?	1+2	1	An	C
2	Discuss the merits and demerits of following operating systems: a) Multiprogramming b) Multitasking	1.5+1.5	1	U	F
3	Consider three CPU-bound processes arriving to a First Come First Served (FCFS) scheduler as follows: **Process** **Arrival time** **Burst time** P1 0 2 P2 1 12 P3 5 1 i) Calculate the average waiting time across all three processes. ii) A weakness of FCFS is that its performance is sensitive to the arrival process. Assume process arrival times remain t = 0, 1, 5 but the arrival order changes. Give an alternative arrival order that improves the average waiting time. Define	1+2	3	A	P

---

4 ... requests y iii) B requests y iv) B requests z v) ... requests z vi) C requests x vii) C requests y Assume ... resources should always be allocated ... 4 5 An

	the convoy effect and give a second alternative arrival order displaying it.				
4	Describe the five-state process model, describe what transitions are valid between the five states, and describe an event that might cause such a transition.	3	2	U	P
5	You are a developer working on a multi-threaded application. The application frequently encounters race conditions, leading to unpredictable behavior and crashes. a) Define what race conditions are and why they occur in multi-threaded applications? b) Discuss synchronization mechanisms and best practices you would use to eliminate race conditions and ensure the application behaves predictably.	1+2	4	An	M

Section – B

*Attempt **All** Questions* 5 X 3 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
6	i) You are tasked with simulating the Dining Philosophers problem, where five philosophers sit around a circular table, and they alternate between thinking and eating. To eat, a philosopher must pick up two forks placed between them and their neighbors. Describe the challenges and potential solutions to this problem using Semaphore. ii) If we add a 6th chopstick to the center of the table, have we cured the deadlock problem? If yes, what condition have we removed? If no, explain why not.	4+1	4	A	P
7	A shared variable x, initialized to zero, is operated on by four concurrent processes W, X, Y, Z as follows. Each of the processes W and X reads x from memory, increments by one, stores it to memory, and then terminates. Each of the processes Y and Z	5	4	An	P

	reads x from memory, decrements by two, stores it to memory, and then terminates. Each process before reading x invokes the P operation (i.e., wait) on a counting semaphore S and invokes the V operation (i.e., signal) on the semaphore S after storing x to memory. Semaphore S is initialized to two. What is the maximum possible value of x after all processes complete execution?				
8	Consider a uniprocessor system executing three tasks T1, T2 and T3, each of which is composed of an infinite sequence of jobs (or instances) which arrive periodically at intervals of 3, 7 and 20 milliseconds, respectively. The priority of each task is the inverse of its period and the available tasks are scheduled in order of priority, with the highest priority task scheduled first. Each instance of T1, T2 and T3 requires an execution time of 1, 2 and 4 milliseconds, respectively. Given that all tasks initially arrive at the beginning of the 1st milliseconds and task preemptions are allowed. In how many milliseconds the first instance of T3 completes its execution?	5	3	E	M

23/10/23 OS → Present

46, 17, 45, 5, 36, 4
39, 68, 67, 59, 63, 28, 41,

Course Name:

Course Outcome

CO1- Understand th
CO2- Understand th
CO3- Apply the con
CO4- Illustrate the
CO5- Analyze the
CO6- Describe and
CO7- Understand t

Printed Pages:

Time: 2 Hours

Instruction for stud

No.	
1	Consider the CPU. All the Calculate t Remaining
2	Explain an How it sati
3	Why Oper monolithi
4	Different Multipro
5	Which sc term sche

P1

Course Name:

Course Outcome

CO1- Understand the classification of operating system environment.
CO2- Understand the basic of process management.
CO3- Apply the concept of CPU process scheduling for the given scenarios.
CO4- Illustrate the process synchronization and concurrency process in operating system.
CO5- Analyze the occurrence of deadlock in operating system.
CO6- Describe and analyze the memory management and its allocation policies.
CO7- Understand the concepts of disk scheduling

Printed Pages: University Roll No. .....

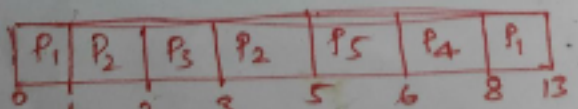
Mid Term Examination, Even Semester 2022-23
B. Tech. (CSE), II Year, III Semester
Operating Systems (BCSC0004)

Time: 2 Hours Maximum Marks: 30

Instruction for students:

Section – A 3 X 5 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Consider the following set of processes that need to be scheduled on a single CPU. All the times are given in milliseconds. Process Name / Execution Time / Arrival Time P1 / 6 / 0 P2 / 3 / 1 P3 / 1 / 2 P4 / 2 / 3 P5 / 1 / 5 Calculate the average process turnaround time (in msec) using the shortest Remaining Time First (SRTF) CPU scheduling algorithm?	3	3	A	P
2	Explain and describe Peterson's Solution for Process synchronization. How it satisfies all conditions of process synchronization?	3	4	E	M
3	Why Operating system called Resource Manager? Discriminate Micro and monolithic kernel on basic of structure, size and speed.	3	1	R, U	F
4	Differentiate between Multiprogramming, Multitasking and Multiprocessing.	3	1	An	C
5	Which scheduler decide the degree of multiprogramming? Explain Mid-term scheduler with diagram.	3	2	U	M



Avg TAT = 4.8 ms

Given 3 proc... and z and following events, i) A requests x ii) A requests z iv) B requests y iii) B requests y iv) B requests z v) C requests y vi) C requests z vii) C requests x viii) C requests y Assume

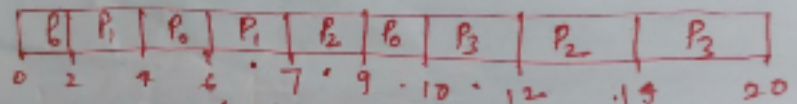
4 5 An

Section – B

5 X 3 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	What is the purpose of System Call? Discuss the solution of Producer and Consumer problem with shared memory.	5	2	U	F
2	What are various process state? Explain and draw 7-State diagram. In what conditions process changes from running to ready state directly.	5	4	U, A	C
3	The following snapshot of the processes are mentioned with no I/O activities. Calculate Turnaround Time, Waiting Time and Response Time for all processes for Round Robin CPU Scheduling Algorithm.	5	3	A	P

Process	Arrival time	Burst Time	
P0	0	5	
P1	2	3	Time Slice= 2
P2	5	4	
P3	9	8	



	A.T	W.T	R.T
P_0 →	10	5	0
P_1 →	5	2	0
P_2 →	9	5	2
P_3 →	11	3	1

Avg TAT = 8.75

Avg WT = 3.75

Avg RT = 0.75

Course Name: OPERATING SYSTEM AND CONCEPTS

Course Outcome

CO1: Understand the classification of operating system environment.
CO2: Understand the basic of process management.
CO3: Apply the concept of CPU process scheduling for the given scenarios.
CO4: Illustrate the process synchronization and concurrency process in operating system.
CO5: Analyze the occurrence of deadlock in operating system.
CO6: Describe and analyze the memory management and its allocation policies.
CO7: Understand the concepts of disk scheduling.

Printed Pages:02 **University Roll No. .....**

Mid Term Examination, Even Semester 2022-23
B. Tech. (Hons.) CS, 2nd Year, VI Semester
BCSE0055 : Operating System and Concepts

Time: 2 Hours **Maximum Marks: 15**

Section – A

Attempt All Questions 1 X 3 = 3 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	What inconveniences that a user can face while interacting with a computer system without an operating system? OR "Operating system is a resource manager". Justify this statement with suitable functionality of OS.	1	1	A	C
2	List the data fields associated with process control block.	1	2	R	F
3	Under what circumstances user level threads are better than the kernel level threads?	1	2	U	C

Section – B

Attempt All Questions 2 X 3 = 6 Marks

No.	Detail of Question	Marks	CO	BL	KL
4	Explain time slicing? How its duration affects the overall working of the system?	2	1	A	P
5	What are the advantages and disadvantages of using the same system call for both files and devices? OR Discuss the transitional changes in process states diagram when blocked-suspended and ready-suspended states are included.	2	1	U	C

Course Name: OPERATING SYSTEM AND CONCEPTS (BCSE 0055)

Course Outcome
CO1: Understand the classification of operating system environment.
CO2: Understand the basic of process management.
CO3: Apply the concept of CPU process scheduling for the given scenarios
CO4: Illustrate theprocess synchronization and concurrency process in operating system
CO5: Illustrate the occurrence of deadlock in operating system
CO6: Analyze the occurrence of the memory management and its allocation policies.
CO7: Understand the concepts of disk scheduling

Printed Pages: 03 University Roll No. .....

Summer Term Carry-Over Examination, Session 2022-23

B.Tech. (Hons.)-CS, II Year, IV Semester

OPERATING SYSTEM AND CONCEPTS (BCSE 0055)

Time: 3 Hours Maximum Marks: 60

Instruction for students:

Section – A

Attempt All Questions 2 X 8 = 16 Marks

No.	Detail of Question	Marks	CO	Bl.	Kl.
1	Why Process Control Block is said to be repository of a process?	2	2	U	C
2	What is convoy effect? Explain with an example.	2	3	R	F
3	Differentiate among short term, medium term and long-term schedulers.	2	3	An	F
4	Explain any three system calls related to process management.	2	2	R	F
5	A system shares 9 tape drives. The current allocation and maximum requirement of tape drives for three processes are shown below: Determine whether system is in safe state or not?	2	5	A	P
6	Explain race condition with an example.	2	4	R	F
7	Differentiate between internal fragmentation and external fragmentation.	2	6	U	C
8	Discuss the effect of thrashing on the system?	2	7	A	C

Process	Current Allocation	Maximum Requirement
P1	3	7
P2	1	6
P3	3	3

Given 3 processes, i) A requests x ii) A requests z and following events, i) A requests x ii) A requests z and following events, i) A requests x ii) A requests z iii) B requests y iv) B requests z v) C requests y iii) B requests y iv) B requests z v) C requests z vi) C requests y Assume requests z vi) C requests y vii) C requests x viii) C requests x should always be allocated

Section – B

Attempt All Questions 5 X 6 = 30 Marks

No.	Detail of Question	Marks	CO	Bl.	Kl
1	Draw the process state transition diagram and explain the transitions of state **i)** running to ready **ii)** waiting to ready **iii)** running to waiting **iv)** blocked to ready **v)** running to terminated. Also explain the situation or states when the system is lacking with main memory.	5	2	U	F

2	Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared boolean variables S1 and S2 are randomly assigned.
	Method Used by P1
	while (S1 == S2) ;
	Critical Section
	S1 = S2;
	Method Used by P2
	while (S1 != S2) ;
	Critical Section
	S2 = not (S1);
	Describe whether the Mutual Exclusion and progress are achieved or not by these processes.
		5	4	An	M

3	Consider the following table of arrival time and burst time for three processes P0, P1 and P2. **Process** **Arrival time** **Burst Time** P0 0 ms 9 ms P1 1 ms 4 ms P2 2 ms 9 ms The pre-emptive shortest job first scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes. What is the average waiting time and turnaround time for the three processes?	5	3	A	P
4	Discuss various free space management techniques with their examples.	5	7	R	F
5	Discuss different file allocation methods with their pros and cons.	5	6	R	F
6	Discuss Belady's Anamoly. Consider a reference string: 4, 7, 6, 1, 7, 6, 4, 2, 7, 2. The number of frames in the memory is 3. Find out the number of page faults respective to Optimal Page Replacement Algorithm OR Compare the paging and segmentation memory management techniques with their merits and demerits.	5	6	A	P

Section – C

Attempt All Questions 7 X 2 = 14 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Differentiate between preemptive and non-preemptive CPU scheduling. Consider the following CPU processes with arrival times (in milliseconds) and length of CPU burst (in milliseconds) as given below: Process Arrival time Burst time P1 0 7 P2 3 3 P3 5 5 P4 6 2 If the pre-emptive shortest remaining time first scheduling and Round Robin with 3 ms time quantum algorithms are used to schedule the processes., then find the average waiting time across all processes.	7	3	A	P
2	What are the parameters to select a best scheduling algorithm? Consider a disk queue with requests for I/O to blocks on cylinders 47, 38, 121, 191, 87, 11, 92, 10. The head is initially at cylinder number 63, moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. Find out total head movement (in number of cylinders) incurred while servicing these requests using C-LOOK and SSTF scheduling algorithms.	7	7	A	P
4	and z and following events, i) A requests x ii) A requests y iii) B requests y iv) B requests z v) C requests z vi) C requests x vii) C requests y Assume that requested resources should always be allocated to the request process if it is available. Draw the	4	5	An	P

Course Outcome:
CO1: Understand the concepts related to functions and services of operating system.
CO2: Describe, contrast and compare different structures of operating system.
CO3: Understand and analyze theory and implementation of processes, resource control, physical and virtual memory concepts, scheduling, I/O and file management.
CO4: Acquire a detailed understanding of aspects of different operating systems.

Printed Pages: 3 University Roll No. .....

End Term Examination, Odd Semester 2022-23

BCA(Hons.) 1st Year, 2nd Semester

BCAC1059: INTRODUCTION TO OPERATING SYSTEMS

Time: 3 Hours **Maximum Marks: 45**

Section – A

Attempt All Questions 4 X 5 = 20 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Given five memory partitions of 500 KB, 350 KB, 250 KB, 420 KB, and 450 KB (in order), how would the, best fit and worst-fit algorithms place processes of 325 KB, 150 KB, 400 KB, and 375 KB (in order)?	4	3	E	PC
2	When one process changes its state from Waiting to **Suspended Waiting** State? Explain with suitable Process State Diagram? Or Explain Task Control Block. What are the operations performed and what is the throughput during context switch?	4	1 1	R U	F C
3	State dining philosopher's problem and give a solution using semaphores. Write structure of philosopher.	4	2	U	C

4	Using Banker's algorithm, answer the following questions: - i. How many resources of type A, B, C, D are there? ii. What are the contents of need matrix? iii. Find if the system is in safe state? If it is, find the safe sequence.	4	3	E	PC
5	How binary semaphore is different from counting semaphore, how binary semaphore solves the problem of more than two process problems?	4	2	An	C

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	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	

Section – B

Attempt All Questions 3 X 5 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
6	Consider a logical address space of 64 pages each of 1024 words mapped onto physical memory of 32 frames. a. How many bits are there in Logical address Space? b. How many bits are there in physical address space?	3	3	E	C
7	How you prevent "Hold and Wait" condition so that deadlock will never occur due to this condition.	3	4	An	P

8	What are the limit for process synch all-necessary Synchronization.
9	Why deadlock starvation? Descr with a deadlock,
10	Suppose that a numbered 0 to serving a requ previous reques of pending req 132, 42, 187 Find Head mo LOOK when he

Attempt All Questio

No.	
11	How Various implemented suitable diagr block (0-15)
12	Consider the 1,2,3,4, How many LRU using 3 Describe the assuming th reference st 7,0,1,2,0,3,0 Find the nu

8	What are the limitations of Peterson's solution for process synchronization? Also discuss the all-necessary conditions for Process Synchronization.	3	2	U	C
9	Why deadlock state more critical than starvation? Describe resource allocation graph with a deadlock, with a cycle but no deadlock.	3	2	U	C
10	Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 100, and the previous request was at cylinder 75. The queue of pending requests, in FIFO order, is: 23, 89, 132, 42, 187 Find Head movement for SSTF, SCAN, C-LOOK when head is moving towards end.	3	3	E	P

Section – C

Attempt All Questions 5 X 2 = 10 Marks

No.	Detail of Question	Marks	CO	BL	KL
11	How Various File Allocation methods are implemented in the system? Explain with suitable diagram. Draw a free space Map for block (0-15) when block 1,3,5, 8, 13 are free.	5	3	A	C
12	Consider the reference stream 1,2,3,4,2,1,5,6,2,1,2,3,7, 6,3,2,1,2,3,6 How many page faults while using FCFS and LRU using 3 frames?	5	3	E	PC
	Or				
	Describe the LRU page replacement algorithm, assuming there are 3 frames and the page reference string is 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2, 0,1, 7, 0, 1, 8 Find the number of page faults.		3	E	PC

Name:

Outcome

- Understand the classification of operating system environment.
- Understand the basic of process management.
- Apply the concept of CPU process scheduling for the given scenarios.
- Illustrate the process synchronization and concurrency process in operating system.
- Analyze the occurrence of deadlock in operating system.
- Describe and analyze the memory management and its allocation policies.
- Understand the concepts of disk scheduling

Printed Pages:

University Roll No. .....

Mid Term Examination, Even Semester 2022-23
B. Tech. (CSE), II Year, III Semester
Operating Systems (BCSC0004)

Time: 2 Hours

Maximum Marks: 30

Instruction for students:

Section – A

3 X 5 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Consider the following set of processes that need to be scheduled on a single CPU. All the times are given in milliseconds. Process Name | Execution Time | Arrival Time P1 | 6 | 0 P2 | 3 | 1 P3 | 1 | 2 P4 | 2 | 3 P5 | 1 | 5 Calculate the average process turnaround time (in msec) using the shortest Remaining Time First (SRTF) CPU scheduling algorithm?	3	3	A	P
2	Explain and describe Peterson's Solution for Process synchronization. How it satisfies all conditions of process synchronization?	3	4	E	M
3	Why Operating system called Resource Manager? Discriminate Micro and monolithic kernel on basic of structure, size and speed.	3	1	R, U	F
4	Differentiate between Multiprogramming, Multitasking and Multiprocessing.	3	1	An	C
5	Which scheduler decide the degree of multiprogramming? Explain Mid-term scheduler with diagram.	3	2	U	M
4	Given 3 processes A, B and C, three resources x, y and z and following events, i) A requests x ii) A requests y iii) B requests y iv) B requests z v) C requests z vi) C requests x vii) C requests y Assume	4	5	An	P

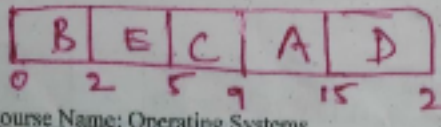
Section – B

5 X 3 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
1.	What is the purpose of System Call? Discuss the solution of Producer and Consumer problem with shared memory.	5	2	U	F
2.	What are various process state? Explain and draw 7-State diagram. In what conditions process changes from running to ready state directly.	5	4	U, A	C
3.	The following snapshot of the processes are mentioned with no I/O activities. Calculate Turnaround Time, Waiting Time and Response Time for all processes for Round Robin CPU Scheduling Algorithm.	5	3	A	P

Process	Arrival time	Burst Time	
P0	0	5	Time Slice= 2
P1	2	3	
P2	5	4	
P3	9	8	

Gantt Chart



Course Name: Operating Systems

Course Outcome

CO1- Understand the classification of operating system environment.
CO2- Understand the basic of process management.
CO3- Apply the concept of CPU process scheduling for the given scenarios.
CO4- Illustrate theprocess synchronization and concurrency process in operating system.
CO5- Analyze the occurrence of deadlock in operating system.
CO6- Describe and analyze the memory management and its allocation policies.
CO7- Understand the concepts of disk scheduling.

Printed Pages:2 **University Roll No. .....**

Mid Term Examination, Even Semester 2021-22
B. Tech. (CSE), II Year, IV Semester
Operating Systems (BCSC0004)

Time: 2 Hours **Maximum Marks: 30**

Note: Attempt all questions.

Section – A 3 X 5 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Consider the following set of processes that need to be scheduled on a single CPU. All the times are given in milliseconds. Process Name / Execution Time: A 6; B 2; C 4; D 6; E 3 Calculate the average process turnaround time (in msec) using the shortest job first scheduling algorithm.	3		A	P
2	Consider the following two-process synchronization solution. Process 0: Entry: loop while (turn == 1); (critical section) Exit: turn = 1; Process 1: Entry: loop while (turn == 0); (critical section) Exit: turn = 0; The shared variable turn is initialized to 0 or 1. Is this solution satisfying all critical section requirement? Justify.	3	4	E	M
4	Given 3 processes A, B and C, three resources x, y and z and following events. i) A requests x ii) A requests y iii) B requests y iv) B requests z v) C requests y vi) C requests z vi) C requests x vii) C requests y Assume	4	5	An	P

3	Identify and explain the type of operating systemsthat focuses on 1) CPU utilization 2) Good response time.	3	1	R,U	F
4	Differentiate between monolithic and micro kernel systems.	3	1	An	C
5	What acts as a repository of a process? What information are stored in it related to a process?	3	2	U	M

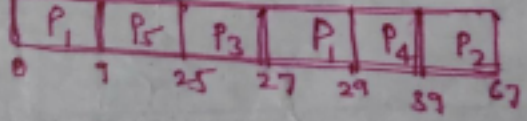
Section – B 5 X 3 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
1	Discuss various process states (7 states) and their meanings with a suitable diagram.	5	2	U	F
2	Discuss Peterson's algorithm with its merits and demerits.	5	4	U, A	C
3	Consider the set of processes with arrival time (in milliseconds), CPU burst time (in milliseconds), and priority (Assume 4 is the highest priority) shown below. None of the processes have I/O burst time.	5	3	A	P

Process	Arrival time	Burst Time	Priority
P1	0	11	2
P2	5	28	0
P3	12	2	3
P4	2	10	1
P5	9	16	4

Calculate the average waiting time (in milliseconds) of all the processes using pre-emptive priority scheduling algorithm.

Gantt Chart



Course Name: Operating Systems

Course Outcome

CO1- Understand the classification of operating system environment.
CO2- Understand the basic of process management.
CO3- Apply the concept of CPU process scheduling for the given scenarios.
CO4- Illustrate the process synchronization and concurrency process in operating system.
CO5- Analyze the occurrence of deadlocks in operating system.
CO6- Describe and analyze the memory management and its allocation policies.
CO7- Understand the concepts of disk scheduling.

Printed Pages:3 University Roll No. .....

End Term Examination, Odd Semester 2022-23
B. Tech. (CSE / EC with minor in CSE), II Year, III Semester
Operating Systems (BCSC0004)

Time: 3 Hours Maximum Marks: 50

Section – A

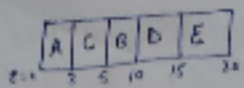
Attempt All Questions 4 X 5 = 20 Marks

No	Detail of Question	Marks	CO	BL	KL
1	State the Reader Write problem and discuss its solution using Semaphore.	4	4	U	C
2	What is convoy effect? Consider the following set of processes that need to be scheduled on a single CPU. All the times are given in milliseconds. Process Name / Arrival Time / Execution Time A / 0 / 5 B / 3 / 2 C / 5 / 4 D / 7 / 6 E / 10 / 8 Using the *shortest remaining time first* scheduling algorithm, calculate the average process turnaround time (in msec).	4	3	A	P
3	What is the main purpose of an operating system? Also, explain the advantages and applications of Multithreaded System?	4	1	U	C
4	Given 3 processes A, B and C, three resources x, y and z and following events. i) A requests x ii) A requests y iii) B requests y iv) B requests z v) C requests z vi) C requests x vii) C requests y Assume that requested resources should always be allocated to the request process if it is available. Draw the	4	5	An	P

BCSE0703

(ii) SRTF -

Gantt chart:



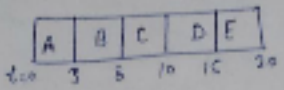
Process	A	B	C	D	E
TT	3	9	2	6	8
WT	0	4	0	1	3

Avg total time ⇒ (3+9+2+6+8)/5 = 5.6

Avg WT ⇒ (0+4+0+1+3)/5 = 1.6

(iii) FCFS -

Gantt chart:



Process	A	B	C	D	E
TT	3	7	7	6	8
WT	0	2	5	1	3

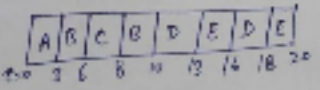
Avg TT ⇒ (3+7+7+6+8)/5 = 6.2

Avg WT ⇒ (0+2+5+1+3)/5 = 2.2

(iv) Round Robin with time slice = 3

Ready Queue = A B C B D E D E

Gantt chart =



Process	A	B	C	D	E
TT	3	9	5	9	8
WT	0	4	3	4	3

Avg. TT = (3+9+5+9+8)/5 = 6.8

Avg. WT = (0+4+3+4+3)/5 = 3.8

Q5:-

Process	Burst time
P_1	10
P_2	27
P_3	3
P_4	7
P_5	12

find Avg. WT & TT for

	resource allocation graph for the sequences. And also mention whether it is a deadlock? If it is, how to recover the deadlock.				
5	What is seek time? Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive currently services a request at cylinder 143, and the previous request was at cylinder 125. the queue of pending request in FIFO order is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130 Starting from the current position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests, for each of the following algorithms i) SSTF ii) C-SCAN.	4	7	A	P

1+1+5+1+5

SSTF - 1745

C-SCAN - 9986

4986

Section – B

3 X 5 = 15 Marks

Answer All Questions

No.	Detail of Question	Marks	CO	BL	KL
6	Explain Belady's Anomaly with an example. A system uses FIFO policy for page replacement. It has 4-page frames with no pages loaded to begin with. The system first accesses 100 distinct pages in some order and then accesses the same 100 pages but now in the reverse order. How many page faults will occur? 196	3	7	An	P
7	What is paging? Consider a paging hardware with a TLB. Assume that the entire page table and all the pages are in the physical memory. It takes 10 milliseconds to search the TLB and 80 milliseconds to access the physical memory. If the TLB hit ratio is 0.6, the effective memory access time (in milliseconds) is 172	3	6	U	C
8	In a virtual memory system, size of virtual address is 32-bit, size of physical address is 30-bit, page size is 16 Kbyte and size of each page table entry is 32-bit. The main memory is byte addressable. Which one of the following is the maximum number of bits	3	6	An	M

$0.6*(10+80) + 0.4*(10+2*80)$

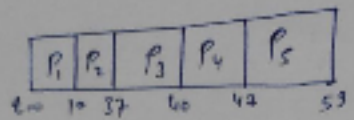
$= 122$ ms

No. of frames $= \frac{2^{30}}{2^{14}} = 2^{16}$

0 2115000459

(i) FCFS :-

Gantt chart



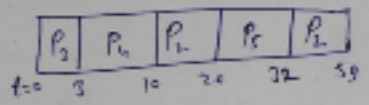
Process	P_1	P_2	P_3	P_4	P_5
TT	10	37	40	47	59
WT	0	10	37	40	47

Avg. TT = $(10+37+40+47+59)/5 = 38.6$

Avg. WT = $(0+10+37+40+47)/5 = 26.8$

(ii) SJF :-

Gantt chart :-



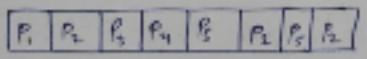
Process	P_1	P_2	P_3	P_4	P_5
TT	20	59	3	10	32
WT	10	32	0	3	20

Avg. TT = $(20+59+3+10+32)/5 = 24.8$

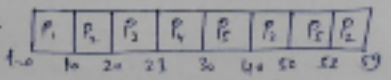
Avg. WT = $(10+32+0+3+20)/5 = 13$

(iii) RR (Quantum = 10 ms)

Ready Queue -



Gantt chart -



Process	P_1	P_2	P_3	P_4	P_5
TT	10	59	23	30	52
WT	0	32	20	23	40

Avg. TT = $(10+59+23+30+52)/5 = 34.8$

Avg. WT = $(0+32+20+23+40)/5 = 23$

	that can be used for storing protection and other information in each page table entry?				
9	Differentiate between internal fragmentation and external fragmentation with example.	3	5	U	R
10	Explain the different methods for free space management with an example.	3	7	An	C

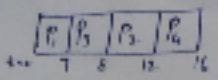
Section – C

Attempt All Questions 5 X 3 = 15 Marks

No.	Detail of Question	Marks	CO	BL	KL
11	Discuss the segmentation memory management technique with an example? Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB. These partitions need to be allocated to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. Perform the allocation of processes using- 1. First Fit Algorithm 2. Best Fit Algorithm 3. Worst Fit Algorithm	5	6	A	P
12	Explain different file allocation methods with their advantages and disadvantages.	5	7	R	C
13	Differentiate between virtual address and physical address. Consider the virtual page reference string 1, 2, 3, 2, 4, 1, 3, 2, 4, 1 On a demand paged virtual memory system running on a computer system that main memory size of 3 pages frames which are initially empty. Find the number of page faults under the corresponding page replacements policy: LRU, FIFO and OPTIMAL.	5	6	An	M

(i) SJF (Non-Preemptive):-

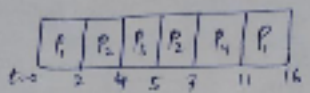
Gantt chart:



Process	P_1	P_2	P_3	P_4
TT	7	10	4	11
WT	0	6	3	7

Preemptive :-

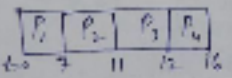
Gantt chart:



Process	P_1	P_2	P_3	P_4
T.T	16	5	1	6
W.T	9	1	0	2

(ii) FCFS :-

Gantt chart:



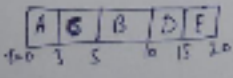
Process	P_1	P_2	P_3	P_4
TT	7	5	8	11
WT	0	5	7	7

Que 4:- Five Process A, B, C, D & E sequence CPU burst 3, 5, 2, 5 and 5 unit time respectively the arrival time in system is 0, 1, 3, 9 & 12 respectively. Draw gantt chart and find Av W.T & T.T for.

(i) SJF:-

Process	A	B	C	D	E
Burst time	3	5	2	5	5
arrivle	0	1	3	9	12

Gantt chart:-

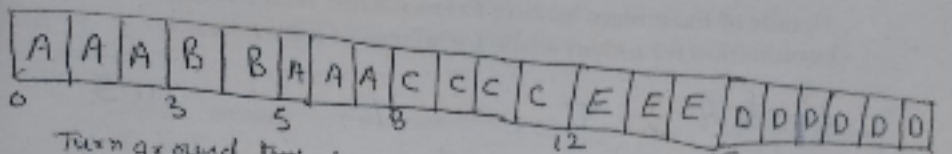


Process	A	B	C	D	E
TT	3	9	2	6	8
WT	0	4	0	1	3

Av. TT = (3+9+2+6+8)/5 = 5.6

Av. WT = (0+4+0+1+3)/5 = 1.6

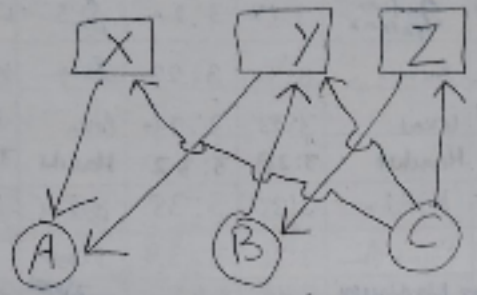
Gantt chart of Q-2 [Sec A]



Turn around time for A-8 B-2 C-7 D-14 E-5

Avg. TAT = 7.2 ms

Q4



There is no cycle, thus no deadlock.

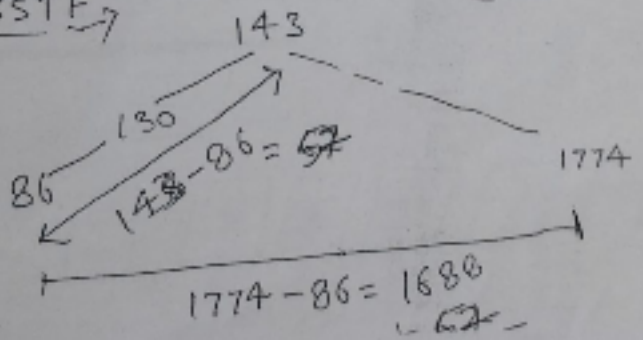
Q5 Disk scheduling using:

~~1770~~

SSTF → 1745

C-SCAN - 9981

SSTF →



Q11 Sec C

200	400	600	500	300	250

first fit

357 → 400
210 → 600
468 → 500
491 will wait

Worst fit

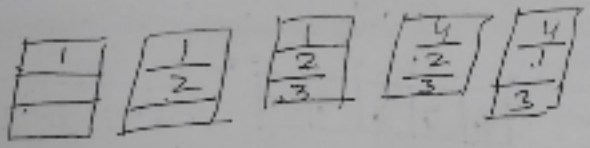
357 → 600
210 → 500
468 and 491 will wait

Best fit

357 → 400
210 → 250
468 → 500
491 → 600

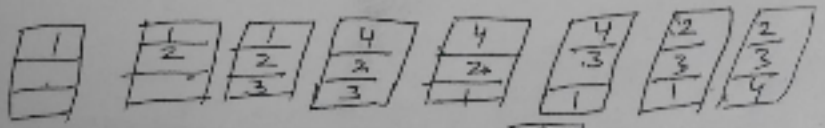
Q13. 1 2 3 2 4 1 3 2 4 1

FIFO



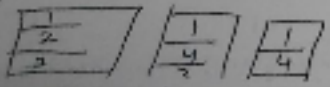
PF 6

LRU



PF = 9

Optimal



PF = 5

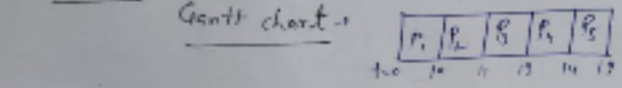
Ques:-

Process	Burst time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

Find Avg. WT & TT for FCFS, SJF, Priority & RR (quantum=1)

i) FCFS:-

Gantt chart →



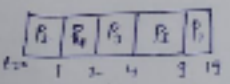
Process	P_1	P_2	P_3	P_4	P_5
TT	10	11	13	14	19
WT	0	10	11	13	14

Avg TT = (10+11+13+14+19)/5 = 13.4

Avg WT = (0+10+11+13+14)/5 = 9.6

(ii) SJF:-

Gantt chart-



Process	P_1	P_2	P_3	P_4	P_5
TT	19	1	4	2	9
WT	9	0	2	1	4

Avg. TT = (19+1+4+2+9)/5 = 7

Avg WT = (9+0+2+1+4)/5 = 3.2