Regular & Supplementary Summer 2024

Course: B. Tech.   **Branch : Computer and Allied**   **Semester: IV**

Subject Code & Name: BTCOC402   **Operating Systems**

Max Marks: 60   **Date: 14/06/2023**   **Duration: 3 Hr.**

Instructions to the Students:
1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Write proper Syntax, example and program wherever necessary.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Explain operating services with respect to programs and users.	**Remember**	**6**
B)	Explain Real time operating system with its types, advantages and examples.	**Synthesis**	**6**
C)	Explain microkernel type operating system structure.	**Understanding**	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	What is thread? Differentiates between user level thread and kernel level thread.	**Synthesis**	**6**
B)	What is inter- process communication in operating System? Explain its types.	**Understanding**	**6**
C)	Consider the set of 5 processes whose arrival time and burst time are given below	**Apply**	**6**

Process	Arrival Time	Brust Time	Priority
P1	0	4	2
P2	1	3	3
P3	2	1	4
P4	3	5	5
P5	4	2	5

If the CPU scheduling policy is priority preemptive, calculate the average waiting time and average turnaround time. (Higher priority number represents higher priority).

Q. 3	**Solve Any Two of the following.**		**12**
A)	Illustrate Peterson's Solution for critical section problem.	**Analysis**	**6**
B)	How the readers and writers problem can be solved using semaphore?	**Evaluate**	**6**

C) Considering a system with five processes P0 through P4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t following snapshot of the system has been taken: Find…   **Apply**   6

Process	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			

i. What will be the content of the Need matrix?

ii. Is the system in a safe state? If Yes, then what is the safe sequence?

Q.4 **Solve Any Two of the following.**   **12**

A) What is demand paging? Explain the steps in handling page fault using appropriate diagram.   **Remember**   6

B) Write short on:
i. Working set model.
ii. Fragmentation   **Knowledge**   6

C) Assume three frames and consider the reference page string below.   **Application**   6
Reference page string: 5, 7, 6, 0, 7, 1, 7, 2, 0, 1, 7, 1, 0

Determine the number of page faults using optimal and least recently used

page replacement algorithm. State which algorithm is most efficient?

Q. 5 **Solve Any Two of the following.**   **12**

A) Explain the linked allocation type disk free space management.   **Remember**   6

B) Explain the contiguous and indexed file allocation methods.   **Analysis**   6

C) Explain following disk scheduling techniques with its advantages …   **Understanding**   6
i. Shortest Seek Time First

ii. SCAN

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE
Supplementary Winter-2023

Course: B. Tech.   **Branch: Computer Engineering**   **Semester: IV**

Subject Code & Name: BTCOC402 & Operating System

Max Marks: 60   **Date:**   **Duration: 3 Hr.**

Instructions to the Students:
1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	List out different services of Operating Systems and Describe each service.	**(2)**	**6**
B)	What are system calls? Explain different categories of system calls with example?	**(2)**	**6**
C)	Describe different sub-components of an operating system.	**(2)**	**6**

Q.2	**Solve Any Two of the following.**		**12**
A)	Consider the following data with burst time given in milliseconds:	**(3)**	**6**

Process	Burst Time	Priority	Arrival time
P1	7	3	0
P2	4	1	2
P3	1	2	4
P4	4	4	5

    i) Draw Gantt charts for the execution of these processes using FCFS, non-preemptive and preemptive SJF, and non-preemptive Priority scheduling.

    ii) What is the Average waiting time of each process for each of the scheduling algorithm.

B)	Describe the actions taken by a kernel to context switch between kernel level threads	**(2)**	**6**
C)	Suppose the following jobs arrive for processing at the times indicated, each job willrun the listed amount of time.	**(3)**	**6**

Job	arrival time	burst time
1	0.0	9
2	0.2	5
3	1.2	2

    i) Give a Gantt chart illustrating the execution of these jobs using the non- preemptive FCFS and SJF scheduling algorithms.

    ii) what is turnaround time and wait time of each job for the above algorithms?

Q. 3 **Solve Any Two of the following.** **12**

A) Examine banker's algorithm after applying to the example given below A **(3)** **6**
system has 5 processes, P1, P2, P3, P4 and P5. There are 2 types of
resources A, and B. there are 10 instances of A, and 5 instances of B. At
time T0, the situation is as follows;

Process- Allocation-   Maximum

         A B   A B

P1   0 1   7 5

P2   2 0   3 2

P3   3 0   9 0

P4   2 1   2 2

P5   0 0   4 3

Is the system in a safe state at time T0?

Suppose now a time T1, process P2 requests one additional instance of
resource type A.

B) Describe necessary conditions for a deadlock situation to arise. **(2)** **6**

C) What is critical section problem and what are the requirements that need to **(2)** **6**
be satisfied by any solution to critical section problem? Give a solution to a
2 processcritical section problem.

Q.4 **Solve Any Two of the following.** **12**

A) Consider a logical address space of 8 pages of 1024 words each, mapped **(3)** **6**
on to a physical memory of 32 frames.

How many bits are there in the logical address?

How many bits are there in the physical address?

B) A process references 6 pages 1, 2, 3, 4, 5, 6 in the following order **(3)** **6**

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

Assuming that the replacement algorithm is LRU, Optimal and FIFO, find
out the number of page faults during the sequence of references, starting
with an empty main memory with 3 frames.

C) Explain with the help of supporting diagram how TLB improves the per- **(2)** **6**
formance of a demand paging system.

Q. 5 **Solve Any Two of the following.** **12**

A) Consider two files systems A and B, that use contiguous allocation and **(3)** **6**
linked allocation, respectively. A file of size 100 blocks is already stored
in A and also in B. Now, consider inserting a new block in the middle of
the file (between 50th and 51st block), whose data is already available in
the memory. Assume that there are enough free blocks at the end of the
file and that the file control blocks are already in memory. Let the number
of disk accesses required to insert a block in the middle of the file in A

and B are n_A and n_B respectively, then the calculate value of $n_A + n_B$.

B) Suppose that a disk drive has 200 cylinders, numbered 0 to 199. the drive currently services a request at cylinder 50, and the previous request was at cylinder 25. the queue of pending request in FIFO order is 82,170,43,140,24,16,190 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)FCFS ii) SSFT iii) SCAN iv)LOOK v) C-SCAN vi) C-LOOK. **(3)** **6**

C) What are the three methods for allocating disk space? Explain with help each method suitable diagram, merits and demerits. **(2)** **6**

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE
Summer Examination – 2023

Course: B. Tech.　　**Branch: Computer Engineering**　　**Semester: IV**

Subject Code & Name: BTCOC402　Operating System

Max Marks: 60　　　　**Date: 15.07.2023**　　　　**Duration: 3 Hr.**

Instructions to the Students:
1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Describe memory layout of multiprogramming operating system. State its advantages.	Understand	**6**
B)	Discuss design goals, polies and implementation of a typical operating system.	Understand	**6**
C)	Explain Virtual Machine (VM) based structure of operating system.	Remember	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	Describe the contents of Process Control Block (PCB).	Remember	**6**
B)	Explain the role of long term, short term and middle term scheduler in process scheduling.	Analyze	**6**
C)	Consider the following set of processes to be executing on uniprocessor system.	Apply	**6**

Processes	AT	BT
A	0	3
B	2	6
C	4	4
D	7	2

Draw the Gantt Chart and calculate average turnaround time and average waiting time for
i)　　SJF Non-preemptive
ii)　　SJF Preemptive

Q. 3	**Solve Any One of the following.**		**12**
A)	Explain the use of Resource Allocation Graph (RAG) in deadlock detection.	Analyze	**6**
B)	Write a pseudocode of Swap instruction used for process synchronization.	Understand	**6**
C)	Examine banker's algorithm for following snapshot of the system, there are 3 processes, P1, P2 and P3. And 3 resource types, R1, R2 and R3.	Apply	**6**

There are 12 instances of resource type R1, 11 instances of resource type R2 and 20 instances of resource type R3.

At time T0, the situation is as follows-

Processes	Allocated Resources			Maximum resources		
	R1	R2	R3	R1	R2	R3
P1	2	2	3	3	6	8
P2	2	0	3	4	3	3
P3	1	2	4	3	4	4

State-

    i)   Contents of matrix Need.
    ii)   Is the system in a safe state at T0?

Q.4   Solve Any Two of the following.   **12**

A) Consider the page reference string-   Apply   **6**
4, 7, 6, 1, 7, 6, 1, 2, 7, 2.
If there is there is three-page frames, calculate page faults for following algorithms-
          i) FIFO page replacement
          ii) LRU page replacement
          iii) Optimal page replacement

B) Explain paging mechanism with neat diagram. State the importance of offset in it.   Understand   **6**

C) Discuss the need of page replacement. Differentiate between local and global page replacement.   Analyze   **6**

Q. 5   Solve Any One of the following.   **12**

A) Explain the concept of file. State various file operations.   Remember   **6**

B) Discuss linked and index disk space allocation methods with neat sketch.   Understand   **6**

C) Write a note on free space management**.**   Understand   **6**

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Semester Examination – January 2023

Course: B. Tech. **Branch : CE / CSE / CS** **Semester : IV**

Subject Code & Name: Operating Systems [BTCOC403]

Max Marks: 60 **Date:** **Duration: 3 Hrs.**

Instructions to the Students:
1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/ CO)	Marks
Q.1	**Solve the following questions.**		**[12]**
A)	Explain the storage system hierarchy of operating system with neat diagram.	2	
B)	Write a Short Note on the following: a) Real-time Embedded System b) Advantages of Multiprocessor System	2	
Q.2	**Attempt the following questions.**		**[12]**
A)	Describe the actions taken by a kernel to context-switch between processes.	2	
B)	Describe Process Control Block with suitable Example.	1	
C)	Determine the average waiting time and draw a Gantt Chart for following process with burst time using Shortest-Job-First scheduling algorithm.	3	

Process	Burst Time
P1	6
P2	8
P3	7
P4	3

Q.3	**Solve Any Two of the following.**		**[12]**
A)	Discuss the Peterson's solution for the critical-section problem.	2	
B)	Explain the Dining Philosopher's problem with the structure of philosophers.	2	
C)	Describe the three requirements to satisfy as a solution to critical-section problem.	1	
Q.4	**Solve any TWO questions of the following.**		**[12]**
A)	Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames. a) How many bits are there in the logical address?	3	

b) How many bits are there in the physical address?

B) Given five memory partitions of 100KB, 500KB, 200KB, 300KB, and 600KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212KB, 417KB, 112KB, and 426KB (in order)? Which algorithm makes the most efficient use of memory?   **3**

C) Consider the following page reference string: **3**

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 following replacement algorithms, assuming five frames? Remember that all frames are initially empty.

    a) LRU replacement

    b) FIFO replacement

    c) Optimal replacement

Q.5   **Solve Any Two of the following.**   **[12]**

A) Enlist and Explain in details the various operations performed on the file.   **2**

B) Describe the following file types with respect to extension used for the file and functioning of the respective file type.   **1**
    a) Executable
    b) object
    c) batch
    d) library
    e) archive
    f) source code

C) Write the name of the terminology used for the boot-control block and volume-control block in Unix and NT File System.   **3**

Consider a file system that uses inodes to represent files. Disk blocks are 8 KB in size, and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, as well as single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system?

*** End ***

S.E [CSF]

Course: B. Tech.   Branch: Computer Engineering   Semester: IV

Subject Code & Name: BTCOC402 & Operating Systems

Max Marks: 60   Date: 18/08/2022   Duration: 3.45 Hr.

Instructions to the Students:
1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level)	Marks

Q. 1 Solve Any Two of the following. *(This is just a sample instruction)*

A) Define a virtual machine with neat diagram. Describe the concept and working of JVM. Explain what are the benefits of a VM? — (2) — 6

B) What is the purpose of command interpreter? Why is it usually separate from the Kernel? — (2) — 6

C) Describe major activities of an operating system in regard to: — (2) — 6

1) Process management   3) Main Memory management

2) File management   4) Secondary storage management

Q.2 Solve Any Two of the following. *(This is just a sample instruction)*

A) Consider the following data with burst time given in milliseconds: — (3) — 6

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

The process has arrived in the order P1, P2, P3, P4, P5.

i) Draw Gantt charts for the execution of these processes using FCFS, SJF, non-preemptive Priority and RR (quantum=2) scheduling.

ii) What is turnaround time and waiting time of each process for each of the scheduling algorithm.

B) What are co-operating processes? Describe the mechanism of inter process communication using shared memory and massage passing — (2) — 6

C) Suppose the following jobs arrive for processing at the times indicated, each job will run the listed amount of time. — (3) — 6

Job	arrival time	burst time
1	0.0	8
2	0.4	4
3	1.0	1

i)   Give a Gantt chart illustrating the execution of these jobs using the non- preemptive FCFS and SJF scheduling algorithms.

ii)   What is turnaround time and waiting time of each job for the above algorithms?

Q. 3 Solve Any Two of the following. *(This is just a sample instruction)*

A)   Examine banker's algorithm after applying to the example given below. A system has 5 processes, P1, P2, P3, P4 and P5. There are 3 types of resources R1, R2 and R3. there are 10 instances of R1, 5 instances of R2 and 7 instances of R3. At time T0, the situation is as follows;   (3)   6

Process	Allocation			Maximum		
	R1	R2	R3	R1	R2	R3
P1	0	1	0	7	5	3
P2	2	0	0	3	2	2
P3	3	0	2	9	0	2
P4	2	1	1	2	2	2
P5	0	0	2	4	3	3

Is the system in a safe state at time T0?

Suppose now at time T1, process P2 requests one additional instance of resource type R1, is the system in a safe state?

B)   Why is deadlock state more critical than starvation? Describe resource allocation graph with a deadlock, also explain resource allocation graph with a cycle but no deadlock.   (2)   6

C)   Describe the bounded-buffer Producer-Consumer problem and give a solution for the same using semaphores. Write the structure of Producer and Consumer processes.   (2)   6

Q.4 Solve Any Two of the following. *(This is just a sample instruction)*

A)   Given memory partitions of 150 K, 250 K, 500 K, 300 K and 600 K (in order) how would each of the first-fit, best-fit and worst-fit algorithms allocate processes of 212K, 417K, 112K and 426 K (in order)? Which algorithm makes the most efficient use of memory?   (3)   6

B) Consider the following page reference string   (3)   6
1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6
Find out the number of page faults if there are 3 page frames, using the following page replacement algorithm i) LRU ii) FIFO iii) Optimal

C) Describe the action taken by the operating system when a page fault occurs   (2)   6
with neat diagram.

Q. 5 **Solve Any Two of the following.** *(This is just a sample instruction)*

A) Describe the different file allocation methods. Also explain the methods of   (2)   6
file implementation with merits and demerits.

B) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. the drive   (3)   6
currently services a request at cylinder 1043, and the previous request was
at cylinder 1225. the queue of pending request in FIFO order is 486, 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) FCFS ii) SSFT iii)
SCAN iv) LOOK v) C-SCAN.

C) Describe how free-space management is implemented in file system. Also   (2)   6
explain bit map with the help of an example

*** End ***