**MARWADI UNIVERSITY**

**Faculty of Engineering**

**Computer Engineering**                                             **[B.Tech ]**

**SEM: 4**                    **MU FINAL EXAM**                    **April: 2023**

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**Subject: - (Operating System) (01CE1401)**            **Date:- 27/04/2023**

**Total Marks:-100**                                         **Time: -3 hrs**

**Instructions:**
1. All Questions are Compulsory.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Do not write/sign/indication/tick mark anything other than Enroll No. at a specific place on the question paper.

**Question: 1.**

(a)    Answer the following MCQs. All questions carries of equal marks            [10]

| | |
|---|---|
| i) | An operating system is ____ which performs the entire basic task like file management, process management, etc.<br>a)Software                                        b)Program<br>c)Process                                          d)Thread |
| ii) | What is the mean of the Booting in the operating system?<br>a) Restarting computer                      b)Install the program<br>c)To scan                                          d)To turn off |
| iii) | At which state the process is waiting to be assigned to a processor?<br>a)New                                            b)Running<br>c)Waiting                                          d)Ready |
| iv) | OS classifies the threads as-<br>a)Mainframe and Mother Board Level<br>b)Kernel and User level<br>c)Security and Memory Level<br>d)OS and CPU level |
| v) | What is the critical section?<br>a) It is the part of the process which is being executed for so long.<br>b) It is the part of the thread which is going to be terminated.<br>c) It is the part of the program where shared resources are accessed by the process.<br>d) It is the part of the program where different processes are shared. |
| vi) | Which of the following algorithm is commonly known as the deadlock avoidance algorithm?<br>a)Round robin                              b)Banker's algorithm<br>c)Shortest job first                          d)First come First Serve |
| vii) | ____ memory is placed between the CPU and the main memory.<br>a)Virtual memory                          b)ROM<br>c)RAM                                            d)Cache |
| viii) | A process which is copied from main memory to secondary memory on the basis of requirement is known as –<br>a)Swapping                                    b)Demand Paging<br>c)Segmentation                              d)Threads |

| | | |
|---|---|---|
| ix) | The time disk controller takes for the beginning of the sector to reach the head is known as_____<br>a) seek time<br>b) rotational delay<br>c) access time<br>d) Transfer time | |
| x) | Which of the following is not a valid extension of an audio file?<br>a) .rar  b) .wav<br>c) .mp3  d) .mid | |

(b) Answer the following Questions. All questions carries of equal marks.  [10]

i) What is Batch Operating system

ii) What is Convoy Effect?

iii) Explain the concept of Context Switching.

iv) Define Race Condition.

v) What is Swapping?

vi) Define: Starvation

vii) What is PCB?

viii) Define Belady's Anomaly.

ix) What is Page Fault?

x) What is Interrupt?

**Question: 2**.

(a) What is Operating System? Explain Different types of Operating System in detail.  [08]

(b) What are system calls? Explain different categories of system calls with examples.  [08]

**OR**

(b) What is Process? Draw a 7 state process transition diagram and explain all the states.  [08]

**Question: 3**.

(a) Consider the following set of processes with length of CPU burst time given in milliseconds.  [08]

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

The processes are assumed to be arrived in order P1, P2, P3, P4 and P5, all at the same time 0.

i. Draw a Gantt chart illustrating the execution of these processes using SJF and non-preemptive priority scheduling. (a smaller no. implies higher priority)

ii. Calculate the average waiting time and average turnaround time for each process using these algorithms.

iii. Which of the algorithms results in the minimum average waiting time.(over all processes)

(b) Discuss the roles of short term, medium term and long term schedulers.  [04]

(c) Differentiate between Preemptive and Non- Preemptive Scheduling.  [04]

**OR**

(a) Consider the following set of processes, with the length of the CPU burst time given in millisecond. [08]

| Process Id | Burst Time |
|------------|------------|
| P1 | 2 |
| P2 | 1 |
| P3 | 8 |
| P4 | 4 |
| P5 | 5 |

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at same time 0.
  i. Draw two Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS and RR (quantum = 2).
  ii. Calculate the average waiting time and average turnaround time for each process using these algorithms.
  iii. Which of the algorithms results in the minimum average waiting time.(over all processes)

(b) What are the necessary conditions to hold a deadlock in a system? [04]

(c) Differentiate between Thread and Process. [04]

## Question: 4.

(a) Describe Banker's algorithm for deadlock avoidance. Consider a system with three processes and three resources. [08]

| Process | Allocation | | | Max | | | Available | | |
|---------|---|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C |
| P0 | 2 | 2 | 3 | 3 | 6 | 8 | 7 | 7 | 10 |
| P1 | 2 | 0 | 3 | 4 | 3 | 3 | | | |
| P2 | 1 | 2 | 4 | 3 | 4 | 4 | | | |

Would the following requests be granted in the current state:
 Process P1 requests (1, 0, 0)

(b) What is critical section problem? Discuss in detail Peterson's solution to the critical section problem? [08]

**OR**

(a) Using Banker's algorithm, answer the following questions: [08]

| Process | Allocation | | | Max | | | Available | | |
|---------|---|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C |
| P0 | 1 | 1 | 2 | 4 | 3 | 3 | 2 | 1 | 0 |
| P1 | 2 | 1 | 2 | 3 | 2 | 2 | | | |
| P2 | 4 | 0 | 1 | 9 | 0 | 2 | | | |
| P3 | 0 | 2 | 0 | 7 | 5 | 3 | | | |
| P4 | 1 | 1 | 2 | 1 | 1 | 2 | | | |

i) How many resources of type A, B, C 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.

(b) Define Producer/Consumer Problem. How it can be solved using Semaphores. [08]

**Question: 5**.

  (a)  Explain the Concept of Paging with the help of diagram and how logical address is converted to Physical address.   [06]

  (b)  What is Thread? Explain the concept of User Level and Kernel Level Threads.   [06]

  (c)  Differentiate between Internal and External Fragmentation.   [04]

<div align="center">**OR**</div>

  (a)  Explain the concept of Demand Paging. Write the steps to manage a page fault with suitable diagram.   [06]

  (b)  What is Multithreading? Explain the different types of Multithreading Models.   [06]

  (c)  What is the difference between Physical and Logical address space.   [04]

**Question: 6**.

  (a)  Consider a disk with 200 tracks (0-199) and the queue has random requests from different processes in the order: 82,170,43,140,24,16,190
Initially arm is at 50. Find the Average Seek length using FIFO, SSTF, SCAN and C-SCAN algorithm.   [08]

  (b)  Explain the following Terms:
Seek Time, Rotational Latency, Transfer Time, Disk Access Time   [04]

  (c)  Define a file system. What are various attributes of a file system?   [04]

<div align="center">**OR**</div>

  (a)  A system uses 4 page frames for storing process pages in main memory. Assume that all the page frames are initially empty. What is the total number of page faults that will occur using FIFO (First in First Out), Optimal and LRU (Least Recently Used) policies for the following page reference string?   [08]
       1, 2, 3, 4, 5, 1, 3, 1, 6, 3, 2, 3
Also find the Page Hit ratio for each of the Algorithm.

  (b)  Explain the single level and two level Directory Structure.   [04]

  (c)  Explain the following File allocation methods:   [04]
    i.  Contiguous Allocation
    ii.  Linked Allocation

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# ---Best of Luck---

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**– Bloom'S Taxonomy Report –**

**Sub: Operating System**
**Sem:4**
**Branch: CE FOT1(MU)/CEFOE1(MU)**

# Que. Paper weightage as per Bloom's Taxonomy

| LEVEL | % of weightage | Question No. | Marks of Que. |
|---|---|---|---|
| Remember/Knowledge | 19% | Q.1.a.i),iii),iv),vi),vii),viii),ix),x) Q.1.b.iv),vi),viii) Q.6.b), Q.6.c) | 19 |
| Understand | 35% | Q.1.a.ii),v) Q.1.b.i),ii),iii),v),vii),ix),x) Q.2.a),Q.2.b) Q.3.b),Q.5.a) | 35 |
| Apply | 32% | Q.3.a),Q.4.a),Q.4.b),Q.6.a) | 32 |
| Analyze | 14% | Q.3.c),Q.5.b),Q.5.c), | 14 |

## Chart/Graph of Bloom's Taxonomy



Ques. Paper weightage as per Bloom's Taxonomy

Remember/Knowledge 19% ■ Understand 35% ■ Apply 32% ■ Analyze 14%