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# SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FOURTH SEMESTER B.TECH DEGREE EXAMINATION (Regular), JULY 2022**
**COMPUTER SCIENCE AND ENGINEERING**
**(2020 SCHEME)**

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| **Course Code :** | **20CST206** |
| **Course Name:** | **Operating Systems** |
| **Max. Marks :** | **100**                           **Duration: 3 Hours** |

## PART A
*(Answer all questions. Each question carries 3 marks)*

1. Differentiate between single processor and multiprocessor systems.
2. What is the necessity of having various modes of execution in a system?
3. Explain the different buffering mechanisms used in message passing systems?
4. Explain life cycle of process with the help of a diagram.
5. Define Semaphore.
6. What are the requirements for a solution to the critical section problem?
7. Differentiate between Internal Fragmentation and External Fragmentation in Paging.
8. Explain the term Dynamic Loading.
9. What is the different between a file and database?
10. List out the advantages of indexed allocation of file space.

## PART B
*(Answer one full question from each module, each question carries 14 marks)*

### MODULE I

11. a) Brief about the structure of operating systems of the following types:
    i. Simple structure
    ii. Layered Systems                                  (8)
    iii. Micro Kernel
    iv. Modular approach
    b) Discuss any six services provided by operating systems.       (6)

### OR

12. a) Under what circumstances would a user be better of using a time-sharing system than a single user system?       (8)
    b) Describe the differences between symmetric and asymmetric multiprocessing.       (6)

### MODULE II

13. a) Discuss the contents of PCB with neat diagram.       (6)
    b) Explain the message passing systems and shared memory systems in Inter Process Communication.       (8)

**OR**

14. a) Consider the following set of processes, with the length of the CPU burst time given in millisecond

| Process | Burst Time | Priority |
|---------|-----------|----------|
| P1 | 2 | 2 |
| P2 | 1 | 1 |
| P3 | 8 | 4 |
| P4 | 4 | 2 |
| P5 | 5 | 3 |

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

(14)

    a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non-preemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2)

    b. What is the turnaround time of each process for each of the scheduling algorithms in part a.

    c. What is the waiting time of each process for each of these scheduling algorithms?

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

## MODULE III

15. a) Explain the Peterson algorithm for solving critical section problem using Software solution. (6)

   b) Discuss in details any two classical problems of synchronization. (8)

**OR**

16. a) An operating system uses the banker's algorithm for deadlock avoidance when managing the allocation of four resource types A,B,C and D to five processes P1,P2,P3,P4 and P5. The table given below presents the current system state. Here, the Allocation matrix shows the current number of resources of each type allocated to each process and the Max matrix shows the maximum number of resources of each type required by each process during its execution.

(8)

| Process | Allocation | | | | Max | | | | Available | | | |
|---------|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | A | B | C | D | A | B | C | D |
| P1 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 2 | 1 | 5 | 2 | 0 |
| P2 | 1 | 0 | 0 | 0 | 1 | 7 | 5 | 0 | | | | |
| P3 | 1 | 3 | 5 | 4 | 2 | 3 | 5 | 6 | | | | |
| P4 | 0 | 6 | 3 | 2 | 0 | 6 | 5 | 2 | | | | |
| P5 | 0 | 0 | 1 | 4 | 0 | 6 | 5 | 6 | | | | |

i) Create the need matrix.

ii) State and Use the safety algorithm to test if the system is in a safe state.

b) What do you mean by binary semaphore and counting semaphore? With C struct, explain implementation of wait() and signal(). (6)

## MODULE IV

17. a) Discuss in details about the demand paging with suitable diagram. (6)

b) Consider 5 memory partitions of 100,275,450,300 and 650 Kilobytes. How would first fit, best fit and worst fit algorithm places processes of 225, 132, 420 and 450 Kilobytes in order. Find which algorithm make effective use of memory for this scenario? (8)

## OR

18. a) Consider the following page reference string:

3 2 1 3 4 1 6 2 4 3 4 2 1 4 5 2 1 3 4.

Assuming demand paging with 3 frames, how many page faults would occur for:-

(i)     FIFO replacement algorithm

(ii)    Optimal replacement algorithm

(iii)   LRU replacement algorithm

What is the hit Ratio for the above algorithms? (10)

b) Point out the difference between segmentation and paging. (4)

## MODULE V

19. a) Explain Sequential access and direct access method. (7)

b) Define a file? Explain about file types, file operations and file attributes. (7)

## OR

20. a) Suppose that a disk drive has 200 cylinders/tracks, numbers 0 to 199. The drive currently serving a request at cylinder/track 50. The queue of pending request, in FIFO order, is

82, 170, 43, 140, 24, 16, 190

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk scheduling algorithms? Also, write the processing order of requests for each scheduling algorithm ad draw the diagram for all algorithms.

(i)     FCFS

(ii)    SSTF

(iii)   SCAN

(iv)    C- SCAN

(v)     LOOK (10)

b) List out the use of access matrix in protection mechanism. (4)

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