SEMESTER EXAMINATION-2021

CLASS - MCA I Sem SUBJECT- Computer Applications

PAPER CODE: MCA-C106 PAPER TITLE: Operating systems

Time: 3 hour **Max. Marks: 70**

Min. Pass: 40%

Note: Question Paper is divided into two sections: **A and B.** Attempt both the sections as per given instructions.

SECTION-A (SHORT ANSWER TYPE QUESTIONS)

Instructions: Each question carries six marks. Attempt any five question. (5 X 6 = 30 Marks)

Question-1: Explain deadlock detection algorithm.
Question-2: Define message passing. Illustrate the implementation of message passing
Question-3: Explain the data structure in Virtual Memory (VM) handler.
Question-4: Compare contiguous and non-contiguous memory allocation techniques.
Question-5: Compare preemptive and non-preemptive scheduling.
Question-6: Define process state. Draw a neat sketch, explain the fundamental state transitions of processes.
Question-7: What is a thread? Compare kernel and user level thread.
Question-8: Describe fixed and variable partitioned contiguous memory allocation schemes along with their merits and demerits.
Question-9: With necessary sketches, explain the different deadlock prevention approaches.
Question-10: What is a directory? Explain directory fields and its operation with a simple directory structure.

SECTION-B

(Long Answer Type Questions)

Instructions: *Answer any four questions in detail. Each question carries ten marks.*

(4 X 10 = 40 Marks)

Question-11: Analyze five services provided by an operating System. Explain how each provides convenience to the users. Explain in which cases it would be impossible for user-level programs to provide these services.

Question-12:

Process	Arrival Time	Burst Time
P1	0.0	7
P2	2.0	4
P3	4.0	1
P4	5.0	4

Calculate the turn-around time and the throughput for preemptive and non-preemptive SJF scheduling algorithms.

Question-13: (a) Consider the following page referencing 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 following replacements algorithms assuming two, three, or four frames?

Remember that all frames are initially empty, so your first unique pages will all cost one fault each.

- LRU replacement
- FIFO replacement
- Optimal replacement

(b) The problem of speed mismatch between the CPU and I/O devices seems to be a

big threat to the system overall performance. So, to avoid this mismatch problem, what mechanisms can be opted so the system performance can be enhanced?

Question-14: Compose two reasons why caches are useful. What problems do they solve? What problems do they cause? If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk) why not make it that large and eliminate the device.

Question-15: Consider the following set of processes, with the length of the CPU Burst time given in milliseconds:

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

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

Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non-preemptive priority (a small number implies higher priority) and RR (time quantum = 1) scheduling.

Question-16: What is a race condition? Explain how a critical section avoids this condition. What are the properties which a data item should possess to implement a critical section? Describe a solution to the dinning philosopher problem so that no races arise.

Question-17: a)Given five memory partitions of 200Kb, 450Kb, 100Kb, 300Kb, 500Kb (in order), how would the first-fit, best-fit and worst-fit algorithms place processes of 312Kb, 215Kb, 132Kb, and 455Kb (in order)? Which algorithm makes the most efficient use of memory?

b) Explain features of various file allocation methods with suitable diagram.

Question-18: Explain the following concepts concerning to the I/O hardware of the system:

(i) Spooling
(ii) Buffering
(iii) Caching

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