

**R19**
**Code No: 862AB**
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**MCA II Semester Examinations, July/August - 2021**
**OPERATING SYSTEMS**
**Time: 3 Hours**
**Max.Marks:75**

**Answer any five questions**  
**All questions carry equal marks**

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- 1.a) Describe how operating systems evolved from simple batch to multi-programmed and time sharing systems.
- b) State and explain the various types of system calls in detail. [9+6]
- 2.a) Explain the differences among short-term, medium-term, and long term scheduling.
- b) Consider the following set of processes, with the length of the CPU burst given in milliseconds: [5+10]

| Process | 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, P5 all at time 0.

- i) Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non-preemptive priority (a smaller priority number implies a higher priority), and RR (quantum= 1).
- ii) What is the turnaround time of each process for each of the scheduling algorithms?
- iii) What is the waiting time of each process for each of these scheduling algorithms?
- iv) Which of the algorithms results in the minimum average waiting time (over all processes)?
- 3.a) Describe how the Swap() instruction can be used to provide mutual exclusion that satisfies the bounded-waiting requirement.
- b) Consider the following snapshot of a system: [5+10]

|    | Allocation | Max     | Available |
|----|------------|---------|-----------|
|    | A B C D    | A B C D | A B C D   |
| P0 | 0 0 1 2    | 0 0 1 2 | 1 5 2 0   |
| P1 | 1 0 0 0    | 1 7 5 0 |           |
| P2 | 1 3 5 4    | 2 3 5 6 |           |
| P3 | 0 6 3 2    | 0 6 5 2 |           |
| P4 | 0 0 1 4    | 0 6 5 6 |           |

Answer the following questions using the banker's algorithm:

- i) What is the content of the matrix Need?
- ii) Is the system in a safe state?
- iii) If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?

- 4.a) Explain the following allocation algorithms,  
i) First fit            ii) Best fit            iii) Worst fit
- b) What is paging? Explain the basic method for implementing paging. [9+6]
- 5.a) Explain the following two directory structures with diagrams:  
i) Tree structured            ii) Acyclic graph
- b) State and explain four approaches to free space management. [8+7]
- 6.a) What is distributed system? List out the differences between distributed systems and conventional operating system.
- b) Write short notes on operating system structure. [7+8]
- 7.a) What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?
- b) Describe the attributes of the process. Describe the typical elements of process control block. [7+8]
- 8.a) Explain how semaphores can be used to control access to a given resource consisting of finite number of instances.
- b) Explain page replacement algorithms with example. [7+8]

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