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Operating Systems (CS341)

Duration: 120 Mins | Mid-Sem Examination | Marks: 60

Instructions:

- **All questions are compulsory.**
- **No doubt will be entertained during the examination.**

wait(), exec(), abort(), fork()

1. Explain the mechanism of multitasking in Andriod-based mobile phones. Discuss any three system calls related to process management in the Windows operating system. [2+2=4]
2. Briefly explain the dual-mode operation of the operating system with a suitable diagram. Further, mention one benefit of dual-mode operation. [2+2+2=6]
3. Define the process control block (PCB) and explain any of its four attributes(or fields). Further, list any four important PCB's attributes required to support multi-threading explicitly. [2+2+2=6]
4. The microkernel structure-based operating systems are more secure and easy to extend. Justify. Further, points out one major drawback of this structure. [2+2+2=6]
5. Define the condition variable and its associated functions in the context of monitors. Suggest an implementation of binary semaphore that eliminates busy waiting in the entry section of the code. [3+3=6]
6. Discuss different CPU scheduling criteria. How is the scheduler different from the dispatcher? Prove formally that the Shortest Job First scheduling algorithm is optimal in that it minimizes the average waiting time for a given set of processes. [1+1+4=6]
7. What is the priority inversion problem? Give an example in which a lower-priority process can prevent a higher-priority process from running. Further, mention how priority inversion handles this. [2+2+2=6]
8. The arrival and burst times for six processes ($A - F$) are given below. Assume that the scheduler takes one unit of time as overhead for handling the process arrival. Compute the average waiting and turnaround times for First-come-first-serve (FCFS) and preemptive Shortest-job-first scheduling algorithms. Which of the algorithms is a good choice for the given scenario and why? [4+4+2=10]

Process ID	Arrival time (msec)	Burst time (msec)
A	0	3
B	1	2
C	2	1
D	3	4
E	4	5
F	5	2

9. Discuss the readers/writers problem in detail. Provide a semaphore solution for the same. You should write the pseudo-code with justification of each possible line. [2+4+4=10]