Question Paper

Exam Date & Time: 02-Jan-2023 (10:00 AM - 01:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal First Semester Master of Engineering - ME (Embedded Systems)Degree Examination - January 2023

Real Time Operating Systems [ESD 5104]

Marks: 100

Duration: 180 mins.

Monday, January 1, 2023

Answer all the questions.

| 1) | Briefly describe the five responsibilities of operating systems. [TLO1.1 CO1 L1] | (10) |
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| 2) | Describe system calls namely fork and join. Explain how their states are useful under schedulers. TLO1.2 CO1 L4] | (10) |
| 3) | Assume that the following five processes arrive at almost the same time, with the length of the CPU burst time given in milliseconds: Process CPU Burst Time P1 12 P2 15 P3 7 P4 9 P5 17 Consider a context switch overhead of 1unit. Determine the average turnaround time and average waiting time with the help of Gantt charts, for the following scheduling algorithms (i)FCFS (ii)SJF (iii) RR (quantum=3) (3+3+4 = 10 MARKS)[TLO2.1 CO1 L2] | (10) |
| 4) | What is meant by a race condition? Explain with the help of an example. Also list and explain the conditions which should be satisfied by any solution to a critical section problem. [TLO2.2 CO2 L2] | (10) |
| 5) | Write a solution using semaphores for controlling traffic with rules are "good"/ "bad" or "dangerous". A 4-way road intersection has cars approaching it from the east, west, north and south directions. Each car is required to follow these rules at the intersection: (i) A car can begin to cross the intersection if some other car(s) immediately ahead of it and travelling in the same direction is/are crossing it, or (ii) A car can begin to cross the intersection if the road on its right does not have any cars waiting to cross the intersection. (Thus, a car approaching the intersection from the east should check whether any cars have already reached the intersection on the road from north and are waiting to cross.) [TLO 2.2 CO2 L4] | (10) |
| 6) | Explain the use of DRAG for (i) deadlock prevention (ii) deadlock avoidance. (2x5marks =10 MARKS) [TLO 2.4 CO2 L2] | (10) |
| 7) | Consider a process that has just forked a child. The OS implements a copy-on-write fork. At the end of the fork system call, the OS does not perform a context switch and will return back to the user mode of the parent process. Explain briefly following at the end of a successful implementation of the fork system call : (i) rolls of the page table of the parent process entities (ii) the page table information in the MMU and TLB access of pages with necessary diagram. (5+5 = 10marks) [TLO2.3 CO2 L3] | (10) |
| 8) | Explain the basic concept of memory segmentation with a neat block diagram.[TLO 2.3 CO2 L1] | (10) |
| 9) | Given memory partitions of 115K, 500K, 200K, 300K, 150K and 600K (in order), how would each of the First-fit, Best-fit and worst fit algorithms place the memory segments of processes of 156K, 120K 212K, 417K, 112K and 226K (in order)? In this case which algorithm makes most efficient use of memory? [TLO 2.3 CO2 L2] | (10) |

Compute the response times for the following tasks based on deadline rate monotonic algorithm. (10) Can the processes be scheduled? Also draw the Gantt chart for the same. Note:- Higher value indicates higher priority. [TLO3.2 CO3 L4] Period T comp. Time, C Priority, P Deadline Task1 7 3 3 5 Task2 12 3 2 6 Task3 20 5 1 22

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