# **Question Paper**

Exam Date & Time: 29-Nov-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 - November / December 2023

#### Real Time Operating Systems [ESD 5104]

#### Marks: 100

Duration: 180 mins.

#### Wednesday, November 29, 2023

### Answer all the questions.

1)	1. Explain why and how a batch processing system was significant during the early days of computing? Also explain how a time sharing system functions. $(5+5) = (10)$ marks	(10)
2)	2. How is communication between processes achieved using Shared Memory system calls? Explain. (10)marks	(10)
3)	3. List and explain the benefits of having threads. Also list any issues with having threads. (6+4) = (10)marks	(10)
4)	<ul> <li>4. Five processes arrive at the same time zero. Their estimated running times are 9, 4, 3, 8 and 2ms. Their priorities are 4, 5, 6, 3, and 5, respectively, with 6 being the highest priority and 3 the least. Draw Gantt charts and determine the turnaround-time and the waiting time of each process by considering the following scheduling algorithms:</li> <li>(i) Round robin scheduling with time slice 3ms</li> <li>(ii) SJF with no pre-emption</li> <li>(iii) Priority scheduling with pre-emption. (10)marks</li> </ul>	(10)
5)	5. What do you understand by an atomic operation? Explain how the wait and signal operations can be used as locks to provide synchronisation to processes. Also explain how the Test_and_Set() instruction hardware lock is defined. $(1+4+5) = (10)$ marks	(10)
6)	6. State and explain the "First Readers Writers" classical synchronisation problem highlighting all the initialisations and assumptions made. (10) marks	(10)
7)	7. What is a deadlock? List and explain the conditions that cause a deadlock. Also provide a OS related deadlock example/situation which satisfies every condition needed for a deadlock to happen. What is the easy way of preventing a deadlock? $(1+6+2+1) = 10$ marks	(10)
8)	8. How are logical addresses mapped to physical addresses in a paging	(10)

scheme? Also with proper block diagrams explain how paging works with the support of TLBs. (4+6) = (10) marks 9) (10)9. For some executing process in a computer system, consider the memory reference string to be: 9 2 3 4 2 5 2 6 4 5 2 5 4 3 4 2 3 9 2 3 List and briefly explain the three page replacement policies, and determine the page faults as well as hits when the same policies are applied to the above string. (Assume, the system has four page frames). (10 marks) 10. (i) List the striking features of a real time system. (10)(ii) Compute the response time for the following tasks, based on Deadline rate monotonic algorithm. Can the processes be scheduled? (Higher number indicates higher priority) \_\_\_\_\_ Period T Deadline comp. Time, C Priority, P \_\_\_\_\_ \_\_\_\_\_ -----Task1 30 10 5 1 Task2 30 8 4 2 Task3 10 5 3 3 Task4 10 5 2 4 \_\_\_\_\_ ---{i.e Tasks : Period T : <30, 30, 10,10> Deadline D : <10, 08, 05, 05> Computing C : <05, 04, 03, 02> Priority P: <01, 02, 03, 04> (Higher number indicates higher priority) } (4+6) = 10 marks

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