Question Paper

Exam Date & Time: 23-Nov-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2022, ICE DEPT

Real Time Operating Sytem [ICE 4060]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

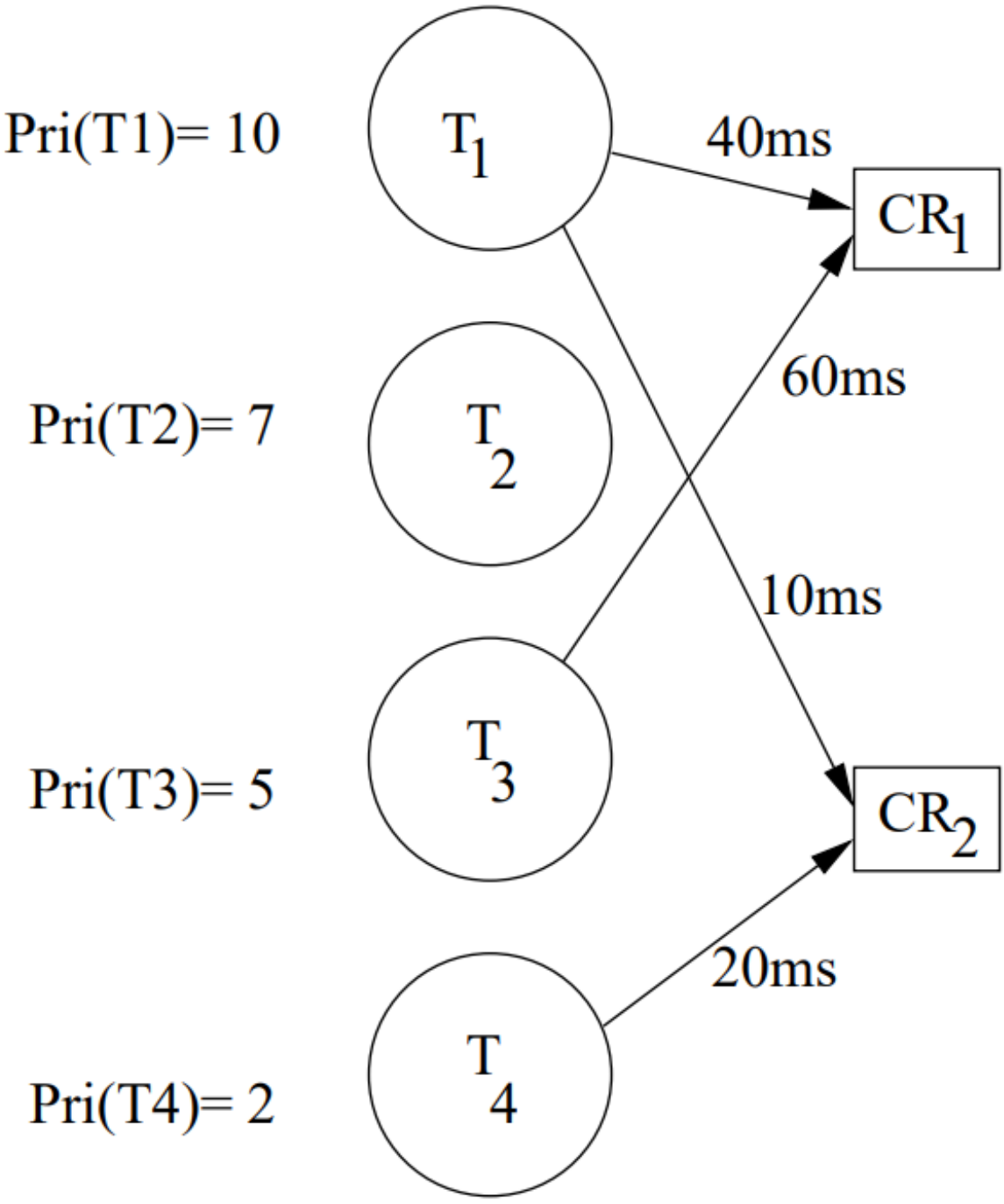
Instructions to Candidates: Missing data may be suitably assumed

1) Explain the N-version scheme and recovery block technique to provide software fault tolerance. [CO1, PO1, BL2] (4)

A)

B) With a block diagram, explain important components of a real time system. [CO1, PO1, BL1] (3)

C) A system has 4 tasks: T1, T2, T3 and T4. These tasks need two critical resources CR1 and CR2. The 4 tasks have been arranged in the decreasing order of their priorities i.e pri(T1) > pri(T2) > pri(T3)>pri(T4). The exact resource requirements and duration for which the tasks need the resources have been shown in Fig. Compute direct inversion and inheritance related inversion. [CO2, PO4, BL4] (3)



2) Consider a real time system in which tasks are scheduled using foreground-background scheduler. There is only one periodic foreground task (2)

A) $T_f = (\Phi_f = 0, p_f = 100ms,\ d_f = 100ms, e_f = 50ms)$ and the background task be $T_b = (e_b = 1000\ ms)$. Suppose an overhead of 1 ms on account of every context switch is to be taken into consideration, compute the completion time of T_b. [CO2, PO2, BL3]

B) Determine whether the following set of periodic real time tasks is schedulable on a uniprocessor using Rate Monotonic Algorithm for the data given in Table. [CO2, PO3, BL3] (5)

Task	Processing Time (ms)	Period (ms)	Deadline (ms)
T_1	25	150	100
T_2	7	40	40
T_3	10	60	50
T_4	10	30	20

C) What do you understand by scheduling point of a task scheduling algorithm? How are the scheduling points determined in (i) clock-driven, (ii) event-driven, (iii) hybrid schedulers? How definition of scheduling point changes while taking into account (a) self-suspension of tasks, and (b) context switching of tasks? [CO2, PO1, BL2] (3)

3) Consider the set of 5 processes whose arrival time and burst time are given in Table. If the CPU scheduling policy is shortest remaining time first (preemptive), calculate the average waiting time and average turn around time. [CO2, PO3, BL3] (5)

A)

Process ID	Arrival time	Burst time
P1	3	1
P2	1	4
P3	4	2
P4	0	6
P5	2	3

B) Explain the parameters of a process control block along with process states. [CO3, PO1, BL1] (3)

C) Four tasks to be executed on a single processor system arrive at time '0' in the order A, B, C, D. Their burst CPU time requirements are 4, 1, 8, 1 time units respectively. What is the completion time of task A and task C under round robin scheduling with time slice of one-time unit? [CO2, PO2, BL3] (2)

4) Explain device management and file system organization in a real time operating system. [CO3, PO1, BL1] (4)

A)

B) Explain bus based and ring based LAN architectures with relevant figures. [CO5, PO1, BL2] (4)

C) What is critical section? What are the control requirements to be satisfied by a process in an operating system to get access to the critical section? [CO3, PO1, BL2] (2)

5) What are the quality of service requirements to ensure satisfactory operations of a network in real time applications? Suppose a network designed using IEEE 802.4 protocol has three nodes. Node N1 needs to transmit 1 MB of data every 300 ms. Node N2 needs to transmit 1.2 MB of data every 500 ms. Node N3 needs to transmit 1.2 MB of data every 500 ms. Select a suitable target token rotation time for the network and compute the token holding time for each node. [CO5, PO1, BL2] (5)

A)

B) Explain working of Portable Software On Silicon (PSOS) real time operating system with relevant figures. Also list its features. [CO4, PO1, BL2] (3)

C) List the features of Versatile Real-Time Executive (VRTX) operating system. [CO4, PO1, BL2] (2)

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