Code : 051812

B.Tech. 8th Semester Exam., 2017

Real Time Systems

Time : 3 hours *Full Marks : 70*

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **Nine** questions in this paper.*

*(iii) Attempt **Five** questions in all.*

(iv) Questions No. 1 is compulsory.

1. Answer any seven (7) questions. 2×7=14

i. In real time operating system

(a) all processes have the same priority

(b) a task must be serviced by its deadline period

(c) process scheduling can be done only once

(d) kernel is not required

ii. Hard real time operating system has ..... jitter than a soft real time operating system.

(a) Less

(b) Equal

(c) more

(d) none of the mentioned

iii. For real time operating systems, interrupt latency should be

(a) Minimal

(b) Zero

(c) maximum

(d) dependent on the scheduling

iv. In rate monotonic scheduling

(a) shorter duration job has higher priority

(b) Longer duration job has higher priority

(c) priority does not depend on the duration of the job

(d) none of the mentioned

v. In which scheduling certain amount of CPU time is allocated to each process?

(a) earliest deadline first scheduling

(b) equal share scheduling

(c) proportional share scheduling

(d) none of the mentioned

vi. The problem of priority inversion can be solved by

(a) priority inheritance protocol

(b) both (a) and (b)

(c) priority inversion protocol

(d) none of the mentioned

vii. Time duration required for scheduling dispatcher to stop one process and start another is known as

(a) process latency

(b) execution latency

(c) dispatch latency

(d) interrupt latency

viii. Time required to synchronous switch from the context of one thread to the context of another thread is called

(a) threads fly-back time

(b) context switch time

(c) jitter

(d) none of the mentioned

ix. Which one of the following is a real time operating system?

(a) RTLinux

(b) windows CE

(c) VxWorks

(d) all of the mentioned

x. VxWorks is centered around

(a) wind microkernel

(b) unix kernel

(c) linux kernel

(d) none of the mentioned

2. (a) Explain the important differences between hard, firm and soft real-time Systems. 7

(b) Explain scheduling point of a task scheduling algorithm. How the scheduling points are determined in (i) clock-driven, (ii) event-driven, (iii) hybrid schedulers? 7

3. (a) What are the distinguishing characteristics of periodic, aperiodic, and sporadic real-time tasks?

(b) A real-time system consists of three tasks T1, T2 and T3. Their characteristics have been shown in the following table.

7+7

Task	Phase (ms)	Execution Time (ms)	Relative Deadline (ms)	*Period (ms)*
T_1	20	10	20	20
T_2	40	10	50	50
T_3	70	20	80	80

Suppose the tasks are to be scheduled using a table-driven scheduler. Compute the length of time for which the schedules have to be stored in the precomputed schedule table of the scheduler. 7

4. (a) Explain the Earliest Deadline First (EDF) algorithm.

   (b) Using a cyclic real-time scheduler, suggest a suitable frame size that can be used to schedule three periodic tasks T1, T2, and T3 with the following characteristics:

Task	Phase (ms)	Execution Time (ms)	Relative Deadline (ms)	Period (ms)
T_1	0	20	100	100
T_2	0	20	80	80
T_3	0	30	150	150

7+7

5. (a) Explain priority inversion in the context of real-time scheduling? 7

   (b) What can be the types of priority inversions that a task might undergo on account of a lower priority task under PCP? 7

6. (a) Why are algorithms which can satisfactorily schedule real-time tasks on multiprocessors not satisfactory to schedule real-time tasks on distributed systems? 7

   (b) What is it required to synchronize the clocks in a distributed real-time system? Compare the advantages and disadvantages of centralized and the distributed clock synchronization. 7

7. A distributed system has 12 clocks with at beast two byzantine clocks. The clocks are required to be resynchronized within 1 ms of each other. The maximum drift rate of the clocks is $6*10^{-6}$. Compute

   (a) The rate at which the clocks need to exchange time values, 7

   (b) The total number of message exchanges required per hour for synchronization. 7

8. (a) Distinguish traffic shaping and policing. 7

(b) Define the concepts of additive, multiplicative and concave constraints that are normally used in QoS routing schemes. 7

9. (a) Describe any two traffic specification models which can satisfactorily be used to specify bursty traffic. 7

(b) Show with an example that EDF is no longer an optimal scheduling policy if pre-emption is not allowed. 7

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