KUMARAGURU
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Register Number: ……..

B.TECH DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2009)

Seventh Semester

INFORMATION TECHNOLOGY

ITY120: Real Time Systems

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A job occurring at random instants of time whose release time is not known but has a hard deadline is called
   a) Periodic job
   b) Hard Real time job
   c) Soft Real time job
   d) Sporadic Job
2. The time duration from the occurrence of the event generating the task to the time the task produces its results is called
   a) Release time
   b) Absolute deadline
   c) Response time
   d) Relative deadline
3. A valid schedule is called a feasible schedule, only if
   a) All tasks are available at time 0
   b) All tasks meet their time constraints
   c) All tasks meet their resource constraints
   d) All tasks meet their precedence constraints
4. A natural way to improve the response times of aperiodic jobs by executing the aperiodic jobs ahead of the periodic jobs whenever possible is called
   a) aperiodic scheduling
   b) resource sharing
   c) preempting
   d) slack stealing
5. The sufficient test for RM algorithm gives
   a) maximum utilisation if there is only one job
   b) Predictable schedulability with average response times
   c) Predictable schedulability with maximum response times
   d) None of the above

6. A poller differs from bandwidth preserving servers in that
   a) It executes aperiodic jobs in queue
   b) Self suspension of server is not permitted
   c) It does not execute the jobs arriving after self suspension
   d) It does not execute aperiodic jobs
7. The disadvantage of Priority Inheritance Protocol is that it does not prevent
   a) preemption
   b) Priority inversion
   c) deadlocks
   d) blocking
8. ---------- allows real-time tasks share critical resources without letting them incur unbounded priority inversions.
   a) Priority Inheritance Protocol
   b) Priority Ceiling Protocol
   c) Preemption Ceiling Protocol
   d) Convex Ceiling Protocol
9. In a non greedy synchronization protocol, the completion time of $J_{i,k;j}$ is the
   a) Execution time of $J_{i,k;j+1}$
   b) release time of $J_{i,k;j+1}$
   c) Period of $J_{i,k;j+1}$
   d) Deadline of $J_{i,k;j+1}$
10. When some packets or message instances are dropped en route for flow and congestion control reasons, it is called
   a) Delay jitter
   b) Loss rate
   c) Miss rate
   d) Invalid rate

PART B (10 x 2 = 20 Marks)

11. List the different types of timing constraints that can occur in a real-time system?
12. Consider the visual and audio displays in a passive sonar system. Which type of graph would be more suitable to describe the system – precedence or task? Explain why?
13. Consider the CD writer and the memory connected to a computer system. Classify which of them is a preemptable resource and explain why.
14. What are the distinguishing characteristics of periodic, aperiodic, and sporadic real-time tasks?
15. For fixed priority tasks with arbitrary response times, it is considered enough to check the maximum response time for schedulability. Prove this statement.
16. When is the hard real time scheduling algorithm said to be optimal?
17. Determine the busy interval for T1 (2,1), T2 (3,1.25), T3 (5,0.25).
18. What can be the types of priority inversions that a task might undergo on account of a lower priority task under PCP?
19. Why are algorithms which can satisfactorily schedule real-time tasks on multiprocessors

not satisfactory to schedule real-time tasks on distributed systems?

20. Explain how priority ceiling protocol avoids deadlock.

PART C (5 x 14 = 70 Marks)

21. a) (i) Explain the difference between hard, soft and firm real time systems with examples. (10)

(ii) What is understood by jitter associated with a periodic task? Mention techniques by which jitter can be overcome. (4)

(OR)

b) (i) Write short notes on the timing constraints in hard and soft real time systems explaining the terminologies. (7)

(ii) Explain the difference between task graph and precedence graph. Give an example for both. (7)

22. a) (i) Explain why frame size is important in scheduling. (4)

(ii) Using a cyclic real-time scheduler, suggest a suitable frame size that can be used to schedule three periodic tasks T1(100,20), T2(80,20), and T3(150,30). (10)

(OR)

b) For the three independent preemptable jobs J1, J2, J3 with execution times, 1,1 and 5 and with deadlines 1,2 and 5 find which one of the algorithms EDF or LST produces an optimal schedule with two processors?

23. a) Explain the operation of a deferrable server (2.5,0.5) with respect to consumption and replenishment using

a. EDF schedule

b. Rate Monotonic Schedule

Assume T_1 (2,3.5,1.5), T_2(0,6.5,0.5) and A(2.8,1.7) and budget is 1.

(OR)

b) Determine whether the following set of periodic real-time tasks is schedulable on a uniprocessor using RM algorithm.

Task	Arrival Time(ms)	Execution time e_i (ms)	Period (ms)	Deadline d_i (ms)
T_1	20	25	150	100

T_2	40	7	40	40
T_3	60	10	60	50
T_4	25	10	30	20

24. a) (i) The following table shows the details of tasks in a real-time system. The tasks have zero phasing and repeat with a period of 90 ms. Determine a feasible schedule to be used by a table-driven scheduler. (9)

Task	Execution Time e_i (ms)	Deadline d_i (ms)	Dependency
T_1	30	90	-
T_2	15	40	T_1,T_3
T_3	20	40	T_1
T_4	10	70	T_2

(ii) Can PIP and PCP considered as greedy algorithms? (5)

(OR)

b) (i) How are deadlocks, unbounded priority inversions, and chain blocking prevented using PCP? (8)

(ii) Explain with an example, how priority inheritance affects the way jobs are scheduled and executed in a Priority-Inheritance Protocol. (6)

25. a) For a system with 4 tasks T1,T2,T3 and T4 the subtasks are given below: $T_{1,1}$(15,1), $T_{1,2}$(15,2),$T_{1,3}$(15,1), $T_{2,1}$(20,4), $T_{3,1}$(2,1), $T_{4,1}$(20,5). The subtasks $T_{1,1}$, $T_{1,3}$ and $T_{2,1}$ execute on P1 and the rest on P2. Calculate the relative deadlines to be assigned if the Effective Deadline algorithm and Proportional Deadline algorithm are followed. Explain the steps.

(OR)

b) Explain the different types of inter processor communication architectures in a multiprocessor environment.

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