KUMARAGURU college of technology
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Register Number:……..

B.TECH DEGREE EXAMINATIONS: NOV 2015

(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. Every safety critical system has a
   a) Fail-safe state
   a) Aperiodic job
   c) Preemptable state
   c) Sporadic job
2. A task graph contains different types of edges that represent different types of
   a) Work flow
   a) times
   c) dependencies
   c) jobs
3. The function which gives the usefulness of the result produced by the job as a function of its tardiness is called
   a) Real time function
   a) Laxity Function
   c) Critical function
   c) validation function
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
   a) resource sharing
   c) preempting
   c) slack stealing.
5. An algorithm which assigns reverse priorities to tasks based on their length of periods (higher priority for shorter period) is
   a) Deadline monotonic algorithm
   a) Round robin scheduler
   c) Dynamic algorithm
   c) Off line scheduler
6. When a sporadic job arrives the scheduler performs an acceptance test to see if
   a) The job is executable
   a) EDF algorithm
   c) The job can be completed by its deadline
   c) Rate monotonic algorithm

7. The period of an end to end periodic task is the period of its
   a) first subtask
   c) All tasks totaled
   a) Direct blocking
   c) Indirect blocking
8. In a non greedy synchronization protocol, the completion time of $J_{i,k;j}$ is the
   a) Execution time of $J_{i,k;j+1}$
   c) Period of $J_{i,k;j+1}$
   a) priority
   c) resource conflict
9. the blocking time *bi (rc)* due to resource conflict of a periodic task *Ti* in a fixed-priority system of *n* periodic tasks is equal to
   a) $bi\ (rc) = \min_{i+1 \le k \le n} (ck)$
   c) $bi\ (rc) = \log_{i+1 \le k \le n} (ck)$
   a) Priority Inheritance
   c) Release Guard
10. If in a system of preempptable independent jobs, preemption can never occur, then the execution of the jobs is
    a) Schedulable
    c) executable
    a) EDF and RG
    c) EDF and MPCP

PART B (10 x 2 = 20 Marks)

11. What are the factors the logical correctness of a real time system depend on? Explain.
12. Consider a 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. Draw a task graph to represent a flight control system. Define the necessary parameters as you go.
14. When is a job considered to be independent?
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. Explain Mutual Exclusion and Critical Sections in terms of resource access.
19. Given three jobs J1, J2, and J3, whose feasible intervals are (6,p,5,14], (2,p,7,17] and (0,p,6,18], Respectively. The jobs are scheduled on the processor on the earliest-deadline-first basis. Check for resource contention, if the critical sections in these jobs are [*R*; 2], [*R*; 4],and [*R*; 4], respectively.
20. Explain direct blocking, avoidance blocking and inheritance blocking.

PART C (5 x 14 = 70 Marks)

21. a) i. 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. (8)

ii. Explain the terms maximum response time and hyper period. (6)

(OR)

b) Write short notes on the timing constraints in hard and soft real time systems

22. a) Explain background execution and polling methods for scheduling aperiodic jobs. Choose tasks as T1 (3,1) and T2 (10,4) and the poller as (2.5,0.5)

(OR)

b) Calculate the frame size for T1 (4,1) T2 (5,1.8), T3 (20,1), T4 (20,2)

23. a) For a system with cyclic schedule of frame size , major cycle of 5 frames, th initial amount of slack are 0.5,1,2,1,1.Compute the average response times for the three aperiodic jobs A1 (4,1.5), A2 (9.5,0.5) and A3 (10.5,2) with slack stealing.

(OR)

b) (i) Compare deferrable servers and sporadic servers. (6)

(ii) Explain about slack stealing in deadline driven systems. (8)

24. a) Explain with a complex example, how priority inheritance affects the way jobs are scheduled and executed in a Priority-Inheritance Protocol

(OR)

b) Explain how deadlock is avoided by Priority Ceiling Protocol.

25. a) For a system with 4 tasksT1,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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