QPC: RJ18001141 AR - 18 Reg. No.

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, June – 2021

(Sixth Semester)

BCSPC6030 – REAL TIME SYSTEMS

(C.S.E)

Time: 2 hrs Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) (1 x 10 = 10 Marks)

Q.1. Answer ***ALL*** questions		[CO#]	[PO#]
a.	In real time operating system		
	(i) all processes have the same priority	(ii) a task must be serviced by its deadline period	1	1
	(iii) process scheduling can be done only once	(iv) kernel is not required		
b.	Hard real time operating system has ___ jitter than a soft real time operating system.		1	1
	(i) less	(ii) more		
	(iii) equal	(iv) none of the mentioned		
c.	In rate monotonic scheduling		1	1
	(i) shorter duration job has higher priority	(ii) longer duration job has higher priority		
	(iii) priority does not depend on the duration of the job	(iv) none of the mentioned		
d.	The problem of priority inversion can be solved by		2	1
	(i) priority inheritance protocol	(ii) priority inversion protocol		
	(iii) both priority inheritance and inversion protocol	(iv) none of the mentioned		
e.	Which one of the following is a real time operating system?		2	1
	(i)) RTLinux	(ii) VxWorks		
	(iii) Windows CE	(iv) All of the mentioned		
f.	Interrupt latency refers to the period of time :		2	1
	(i) from the occurrence of an event to the arrival of an interrupt	(ii) from the occurrence of an event to the servicing of an interrupt		
	(iii) from arrival of an interrupt to the start of the interrupt service routine	(iv) none of the mentioned		
g.	In a safety critical system, incorrect operation :		3	1
	(i) does not affect much	(ii) causes minor problems		
	(iii) causes major and serious problems	(iv) none of the mentioned		
h.	The _____ scheduling algorithm schedules periodic tasks using a static priority policy with preemption.		3	1
	(i) earliest deadline first	(ii) rate monotonic		
	(iii) first cum first served	(iv) priority	4	1
i.	Rate monotonic scheduling assumes that the :			
	(i) processing time of a periodic	(ii) processing time of a periodic		

process is same for each CPU burst | process is different for each CPU burst
(iii) periods of all processes is the same | (iv) none of the mentioned

j. Earliest deadline first algorithm assigns priorities according to : 4 1
(i) periods | (ii) deadlines
(iii) burst times | (iv) none of the mentioned

PART – B: (Short Answer Questions) (2 x 5 = 10 Marks)

Q.2. Answer ***ALL*** questions [CO#] [PO#]

a. Why It is difficult to achieve software fault tolerance as compared to hardware fault tolerance? 1 1

b. Identify two major shortcomings of EDF while using it in real-time task scheduling. 1 1

c. What is a clock-driven scheduler and how it is different from the event-driven scheduler? 2 1

d. Distinguish traffic shaping and policing. 3 1

e. What is Task Criticality? Why is it important to consider task criticality while designing Fault tolerant system? 4 1

PART – C: (Long Answer Questions) (6 x 5 = 30 Marks)

Answer ***ANY FIVE*** questions Marks [CO#] [PO#]

3. What do you mean by Real-time system? Using a block diagram shows the important hardware components of a real time system and interactions Explain the roles of different components. (6) 1 1

4. Why is it necessary to synchronize the clocks in a distributed real-time system? Discuss the relative advantages and disadvantages of the centralized and distributed clock synchronization scheme. (6) 1 1

5. What do you mean by fault tolerance? How fault are classified according to their temporal behavior and output behavior? Discuss various types of redundancies required to design a fault tolerance system. (6) 2 1

6. Why is dynamically changing the priority levels of tasks important for traditional operating systems? How does this property affect real time systems? (6) 2 1

7. 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. (6) 3 2

Task	Phase (ms)	Execution Time (ms)	Relative Deadline (ms)	Period (ms)
T1	0	20	100	100
T2	0	20	80	80
T3	0	30	150	150

8. What is cyclic scheduler? How it differs from table driven scheduler? Discuss the important constraints that a selected frame size must satisfy (6) 3 1

in cyclic scheduling. Prove that minimum separation of the task arrival from corresponding frame start time considering all instances of a task ti is equal to GCD (F, P_i).

9. Describe RMA task scheduling algorithm and discuss different schedulability test for RMA. (6) 4 2

   Let T_1 (e_1 = 10, p_1 = 50, d_1 = 35), T_2 (e_2 = 15, p_2 = 100, d_2 = 20), T_3 = (e_3 = 20, p_3 = 200, d_3 = 200) be a task set. Check whether this task set is RMA schedulable? Justify and if not schedulable show the alternative algorithm for scheduling it.

10. A real-time network consists of four nodes, and uses IEEE 802.4 protocol. The real-time requirement is that node N_i should able to transmit up to b_i bits over each period of duration P_i ms, where b_i and P_i are given in the table below. (6) 4 2

Node	B_i	P_i
N_1	1K	10000
N_2	4K	50000
N_3	16K	90000
N_4	16K	90000

Compute a suitable TTRT and obtain suitable values of f_i (total number of bits that can be transmitted by node N_i once every cycle). Assume that the propagation time is compared to TTRT and that the system bandwidth is 1 Mbps.

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