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BTECH
(SEM VII) THEORY EXAMINATION 2024-25
REAL TIME OPERATING SYSTEMS

TIME: 3 HRS

M.MARKS: 100

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

Q no.	Question	CO	Level
a.	How have advancements in hardware and software influenced RTOS evolution?	1	K ₁ , K ₂
b.	Discuss importance of Real-Time Service Utility.	1	K ₁ , K ₂
c.	How do capacity and allocation strategies affect system performance?	2	K ₃
d.	What are the challenges associated with using shared memory?	2	K ₃
e.	Describe the principles of high reliability design in real-time systems.	3	K ₁ , K ₂
f.	What are the common pitfalls for designing reliable software for real-time systems?	3	K ₁ , K ₂
g.	How can ECC memory enhance the reliability of shared memory operations?	4	K ₃
h.	Analyze the challenges of using flash file systems in real-time embedded systems.	4	K ₃
i.	What techniques can be used to prevent or mitigate priority inversion?	3	K ₁ , K ₂
j.	How do missed deadlines affect QoS?	3	K ₁ , K ₂

SECTION B

2. Attempt any three of the following: 10 x 3 = 20

Q no.	Question	C O	Level
a.	Analyze the role of resource analysis in real-time embedded systems. How does it impact the overall performance and reliability of an RTOS?	1	K ₁ , K ₂
b.	Define the concepts of blocking, deadlock, and livelock in the context of multi-resource services in real-time systems. How can critical sections be used to protect shared resources?	2	K ₃
c.	Compare path length, efficiency, and call frequency as fundamental optimizations in real-time systems. How can these optimizations improve system performance?	3	K ₁ , K ₂
d.	Discuss the intermediate I/O strategies in real-time embedded systems. How do they enhance I/O performance?	4	K ₃
e.	Explain the role of firmware components in real-time embedded systems. How do they interact with the RTOS and application software?	3	K ₁ , K ₂

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	C O	Level
a.	Discuss the importance of thread-safe reentrant functions in real-time operating systems. How do they contribute to system stability and reliability?	1	K ₁ , K ₂

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b.	Explain the feasibility tests for preemptive fixed-priority scheduling. How do the rate monotonic least upper bound and deadline-monotonic policies differ in terms of feasibility?	1	K ₁ , K ₂
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4. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	C O	Level
a.	Discuss the components of firmware in embedded systems. How do these components interact with RTOS system software mechanisms?	2	K ₃
b.	Describe the process of debugging real-time embedded systems using kernel scheduler traces. What insights can be gained from these traces?	2	K ₃

5. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Analyze the process of application-level debugging in real-time systems. How does it differ from kernel-level debugging?	3	K ₁ , K ₂
b.	Explain the concept of drill-down tuning in performance optimization of real-time systems. How can hardware-supported profiling and tracing aid in this process?	3	K ₁ , K ₂

6. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Explain the cyclic executive model in detail. How does it manage task scheduling and execution in real-time systems?	4	K ₃
b.	Analyze the impact of preemptive fixed priority scheduling on system performance. How does it handle high-priority and low-priority tasks?	4	K ₃

7. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Explain the concept of kernel scheduler traces in debugging. How can these traces be used to optimize system performance?	3	K ₁ , K ₂
b.	Analyze the significance of test access ports and trace ports in debugging embedded systems. How do they facilitate the identification and resolution of hardware and software issues?	3	K ₁ , K ₂