Printed Page: 1 of 2

1 | Page

PAPER ID-311126

BTECH

(SEM V) THEORY EXAMINATION 2023-24

Roll No:

EMBEDDED SYSTEMS AND REAL TIME OPERATING SYSTEM

TIME: 3 HRS

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

Q no.	Question	Marks	CO
a.	What is the primary purpose of an embedded operating system?	2	1
b.	Name two key components of the kernel in an embedded OS.	2	1
c.	List two popular open-source RTOS platforms and their key features.	2	2
d.	Define hard real time and soft real time.	2	2
e.	What is the purpose of a scheduler in a real-time kernel?	2	3
f.	How does a real-time kernel ensure deterministic behavior in task execution?	2	3
g.	Define a semaphore and explain its use in real-time systems.	2	4
h.	How does FreeRTOS manage task synchronization.	2	4
i.	Provide an example of an embedded system where a real-time operating system is crucial.	2	5
j.	What are cross compilers?	2	5

SECTION B

2. Attempt any three of the following:

Compare and contrast monolithic and microkernel architectures in the context of embedded operating systems. Highlight their advantages and 10 1 a. disadvantages. What are the main characteristics of open-source real-time operating systems? Discuss the advantages and challenges associated with using 10 2 b. open-source RTOS in embedded systems. Explain the concept of task scheduling in real-time operating systems. 3 10 c. Describe various scheduling algorithms used in real-time kernels Compare and contrast VxWorks and FreeRTOS in terms of architecture, features, and performance. In what scenarios would one be preferred 4 d. 10 over the other? Explain the role and significance of simulators, debuggers, crosscompilers, and in-circuit emulators in the software development life 10 5 e. cycle for microcontrollers.

SECTION C

Attempt any one part of the following: 3.

Discuss the role of interrupt handling in embedded systems and how it 10 1 a. contributes to achieving real-time responsiveness. Describe the process of task scheduling in embedded operating systems. b. 10 1 How does it impact the real-time performance of the system?

M.MARKS: 100

 $2 \ge 10 = 20$

10x3=30

Subject Code: KOT055

10x1 = 10

2 | Page QP24DP1 290 | 02-02-2024 13:31:24 | 117.55.242.132

Subject Code: KOT055 **Roll No:**

BTECH

(SEM V) THEORY EXAMINATION 2023-24

4. Attempt any one part of the following:

a.	Explain the role of file systems in RTOS and the challenges associated with providing efficient file I/O operations in a real-time context.	10	2
b.	Describe the basic architecture of an RTOS, breaking down its components and their roles in managing real-time tasks.	10	2

5. Attempt any one part of the following:

a.	Provide an in-depth analysis of the FreeRTOS scheduling algorithm. How does it manage task priorities and deadlines to ensure real-time responsiveness?	10	3
b.	What are the key differences between a standard Linux kernel and a real- time Linux kernel, and why might there be a need to convert a normal kernel to a real-time variant?	10	3

Attempt any one part of the following: 6.

a.	Provide an overview of the general architecture of I/O systems .Discuss the importance of device drivers and their role in facilitating communication between the operating system and peripheral devices.	10	4
b.	Describe how tasks are created, managed, and interact with interrupts in real-time operating systems.	3 10	4

7. Attempt any one part of the following:

Discuss the key considerations, steps, and challenges involved in adapting an OS/RTOS to specific hardware. How does this process 10 5 a. contribute to the overall performance and functionality of the embedded system? Describe the best practices for testing a real-time application. Also discuss the challenges specific to real-time applications and how these 5 b. 10 differ from traditional software testing.

02.02

EMBEDDED SYSTEMS AND REAL TIME OPERATING SYSTEM

PAPER ID-311126

TIME: 3 HRS

10x1 = 10

10x1 = 10

10x1=10

10x1=10

M.MARKS: 100