



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

Course Title	EMBEDDED REAL TIME OPERATING SYSTEMS				
Course Code	BESB22				
Programme	M. Tech				
Semester	III				
Course Type	Professional Elective				
Regulation	IARE-R18				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	3	-	3	-	-
Course Faculty	Dr. P Munaswamy, Professor Ms. M Sugana Sri, Assistant Professor				

COURSE OBJECTIVES

The course should enable the students to:	
I	Understand different WLAN topologies and transmission techniques.
II	Interpret Bluetooth and Zigbee technologies.
III	Enhance the understanding of 3G systems and 4G networks.

COURSE OUTCOMES (COs):

CO 1	Understand the concepts of various operating systems for embedded systems and describe the basic commands to perform operations on files.
CO 2	Explore the structures, task services, states and other basic operations of the real time operating systems.
CO 3	Demonstrate the objects, services, I/Os and other building blocks of the real time operating systems
CO 4	Explore exceptions, timers interrupts, service routines and other operations of the RTOS
CO 5	Develop knowledge and practical skills through case studies of various RTOS.

COURSE LEARNING OUTCOMES (CLOs):

BESB226.01	Understand the basic UNIX/LINUX programming.
BESB226.02	Understand the overview of commands, file I/O process control.
BESB226.03	Understand the history of OS, RTOS, characteristics of RTOS
BESB226.04	Understand the defining a task, task states, scheduling and synchronization.
BESB226.05	Understand the various components of the RTOS.

BESB226.06	Analyze the objects and services of the RTOS.
BESB226.07	Evaluate the Pipes, event registers, other building blocks, and component configuration.
BESB226.08	Understand the device I/O management, Exceptions, interrupts and event handling.
BESB226.09	Analyze the real time clocks, Programmable timers, timer interrupt service routines.
BESB226.10	Understand the basic concepts of RT Linux, Micro C/OS-II
BESB226.11	Understand the basic concepts of Vx works, embedded Linux, tiny OS
BESB226.12	Understand the basic concepts of android OS.

TUTORIAL QUESTION BANK

S.No	QUESTION	Blooms Taxonomy level	Course Outcomes	Course Learning Outcomes
UNIT-I				
INTRODUCTION				
Part - A (Short Answer Questions)				
1	What is RTOS ?	Understand	CO 1	CLO 1
2	What is open, create, close?	Understand	CO 1	CLO 1
3	Write the command for file I/O?	Remember	CO 1	CLO 1
4	Write the command for lseek, read, write?	Understand	CO 2	CLO 1
5	What is process control what are the commands used for it?	Understand	CO 2	CLO 1
6	What is fork and v fork and write commands?	Remember	CO 1	CLO 1
7	Write commands for exit, wait ?	Understand	CO 2	CLO 2
8	Write commands for waitpid, exec ?	Understand	CO 2	CLO 2
9	What is UNIX	Understand	CO 1	CLO 2
10	What is LINUX?	Understand	CO 1	CLO 2
11	What is shell?	Remember	CO 1	CLO 1
12	Name the commonly used shells on different UNIX/Linux variants.	Understand	CO 2	CLO 2
13	What is hidden file?	Remember	CO 1	CLO 1
14	What is process?	Understand	CO 2	CLO 2
15	What is the role of kernel?	Remember	CO 1	CLO 1
16	What is RTOS? Give one practical example where RTOS is used.	Understand	CO 2	CLO 2
17	Briefly describe the Hard Real Time Systems.	Remember	CO 1	CLO 1
Part - B (Long Answer Questions)				
1	Define RTOS. What are the key characteristics of an RTOS	Understand	CO 1	CLO 1
2	Explain file I/O functions: Lseek, open, Read, Write.	Understand	CO 1	CLO 1
3	What is a kernel? Explain the Kernel services in an operating system	Remember	CO 1	CLO 1
4	What are OS services? Explain the structures of user and supervisory mode.	Understand	CO 2	CLO 1
5	What are RTOS services	Understand	CO 2	CLO 1
6	Write about the kernel services in an OS.	Remember	CO 1	CLO 1

S.No	QUESTION	Blooms Taxonomy level	Course Outcomes	Course Learning Outcomes
7	What are the basic operating system services available? Explain how to perform memory management for a specific operating system	Understand	CO 2	CLO 2
8	Explain an embedded system design approach using an RTOS environment	Understand	CO 2	CLO 2
9	Explain the file I/O commands briefly	Understand	CO 1	CLO 2
10	Explain the following terms, i)fork ii) vfork iii)exit iv)wait v) waitpid	Understand	CO 1	CLO 2
Part - C (Analytical Questions)				
1	Write the commands used to handle processes in Unix	Understand	CO 1	CLO 1
2	Explain the directory structure in Unix operating system	Understand	CO 1	CLO 1
3	Write about precedence graph and task graph.	Remember	CO 1	CLO 1
4	Explain periodic task model.	Understand	CO 2	CLO 2
5	Write the function of the following: i)lseek ii) vfork iii) waitpid iv) pend v) fwrite vi) OSSEM Post	Understand	CO 2	CLO 2
6	What is RTOS? Give one practical example where RTOS is used.	Remember	CO 1	CLO 2
7	Briefly describe the Hard Real Time Systems.	Understand	CO 1	CLO 2
UNIT-II REAL TIME OPERATING SYSTEM				
Part – A (Short Answer Questions)				
1	What is OS?	Understand	CO 2	CLO 3
2	What is the difference between OS and RTOS?	Understand	CO 2	CLO 3
3	What are the characteristics of RTOS	Remember	CO 2	CLO 3
4	What is a scheduler and what are its services?	Understand	CO 2	CLO 3
5	Define a task ?	Understand	CO 2	CLO 4
6	What are task operations?	Understand	CO 2	CLO 4
7	What is message queue?	Understand	CO 2	CLO 4
8	What is semaphores ?	Remember	CO 2	CLO 5
9	What is concurrency?	Understand	CO 2	CLO 5
10	What are operations and its uses	Understand	CO 2	CLO 5
11	What are the synchronization issues in task communication?	Understand	CO 2	CLO 4
12	Explain the sockets in task communication.	Remember	CO 2	CLO 5
13	What is meant by task scheduling?	Understand	CO 2	CLO 5
14	Define shared memory in RTOS.	Understand	CO 2	CLO 4
15	Explain the importance of queues in RTOS.	Remember	CO 2	CLO 5
16	Describe the scheduling Hierarchy of Real Time Systems.	Understand	CO 2	CLO 5
17	Explain the queue structure for EDF scheduling approach.	Understand	CO 2	CLO 4
18	Explain Handling of Interrupt source calls.	Remember	CO 2	CLO 5

S.No	QUESTION	Blooms Taxonomy level	Course Outcomes	Course Learning Outcomes
19	Discuss the RTOS Task scheduling Models.	Understand	CO 2	CLO 5
20	Write about the Periodic Task model?	Understand	CO 2	CLO 4
Part - B (Long Answer Questions)				
1	Explain the scheduling algorithms to a weighted round robin approach with an example?	Understand	CO 2	CLO 3
2	What is meant by scheduling mechanism? List any 4 scheduling algorithms and explain one of them with example?	Understand	CO 2	CLO 3
3	What are the different types of scheduling strategies used in RTOS? Explain briefly?	Understand	CO 2	CLO 3
4	Explain task states and scheduling?	Understand	CO 2	CLO 3
5	Define scheduler. Explain any scheduling algorithm?	Understand	CO 2	CLO 4
6	What are the various RTOS task scheduling models available? Explain any one of them in details?	Remember	CO 2	CLO 4
7	Explain the message queue and different states in queue?	Understand	CO 2	CLO 4
8	Explain briefly about semaphores with examples?	Understand	CO 2	CLO 5
9	Explain the communication and concurrency with examples?	Remember	CO 2	CLO 5
10	Explain the synchronization and task operation with examples?	Understand	CO 2	CLO 5
Part - C (Analytical Questions)				
1	Describe the weighted round-robin scheduling approach with example.	Understand	CO 2	CLO 3
2	Briefly describe the greedy scheduling approach for real time applications.	Understand	CO 2	CLO 3
3	Describe the external interrupts and Immediate interrupt service.	Understand	CO 2	CLO 4
4	Explain the memory management tasks handled in Vxworks.	Understand	CO 2	CLO 4
5	How concurrency is handled in Vxworks using semaphores?	Remember	CO 2	CLO 4
6	Explain the queue structure for EDF scheduling approach.	Understand	CO 2	CLO 4
7	Explain Handling of Interrupt source calls.	Understand	CO 2	CLO 5
8	Discuss the RTOS Task scheduling Models.	Understand	CO 2	CLO 5
9	Write about the Periodic Task model?	Understand	CO 2	CLO 5
10	Describe the scheduling Hierarchy of Real Time Systems.	Understand	CO 2	CLO 5
UNIT-III				
OBJECTS, SERVICES AND INPUT OUTPUTS				
Part - A (Short Answer Questions)				
1	What is a pipe?	Understand	CO 3	CLO 6
2	What is event register?	Remember	CO 3	CLO 6
3	What is a signal?	Remember	CO 3	CLO 6
4	What are building blocks?	Remember	CO 3	CLO 6
5	Write about component configuration?	Understand	CO 3	CLO 6
6	What are basics I/O?	Remember	CO 3	CLO 7
7	What are I/O subsystems?	Understand	CO 3	CLO 7
8	Define tasks and assign the task priority	Remember	CO 3	CLO 7

S.No	QUESTION	Blooms Taxonomy level	Course Outcomes	Course Learning Outcomes
9	Define Dead lock ?	Understand	CO 3	CLO 7
10	Describe hard vs soft real time systems	Remember	CO 3	CLO 7
11	What is the difference between Hard and Soft real time systems?	Understand	CO 3	CLO 6
12	Differentiate process and thread and and define task and explain with diagram all the five states of task	Remember	CO 3	CLO 7
13	Give an example for Hard and Soft real time kernels?	Understand	CO 3	CLO 7
14	write short notes on pipes	Remember	CO 3	CLO 7
15	List the layers between application and hardware of RTOS.	Understand	CO 3	CLO 6
16	Give examples of IO subsystems. Explain the use of asynchronous I/Os.	Remember	CO 3	CLO 7
17	Explain priority – Driven scheduling approach for real –time systems with an example.	Understand	CO 3	CLO 7
18	Write about the embedded system design process for a smart card in detail.	Remember	CO 3	CLO 7
19	List the layers between application and hardware of RTOS.	Understand	CO 3	CLO 7
20	Give examples of IO subsystems. Explain the use of asynchronous I/Os.	Remember	CO 3	CLO 7
Part - B (Long Answer Questions)				
1	Define scheduler. Explain any scheduling algorithm.	Understand	CO 3	CLO 6
2	Define Semaphore. Explain the uses of Semaphore.	Remember	CO 3	CLO 6
3	Explain the following (i) Dead lock (ii)Message queue	Remember	CO 3	CLO 6
4	Explain the following (i) Recursive locking (ii)Pipe states	Remember	CO 3	CLO 6
5	Define the table for kernel services in an operating system with functions and actions.	Understand	CO 3	CLO 6
6	Differentiate process and thread and and define task and explain with diagram all the five states of task	Remember	CO 3	CLO 6
7	Explain the creation and activation of a task by task spawn function in VxWorks. For task priority function, Define 3 options on spawning.	Understand	CO 3	CLO 7
8	Explain the event registers and signals with examples	Remember	CO 3	CLO 7
9	Explain the basics I/O concepts with examples	Understand	CO 3	CLO 7
10	Explain the I/O subsystem with RTOS examples	Remember	CO 3	CLO 7
Part - C (Analytical Questions)				
1	Describe the pipes and its usage in interprocess communications.	Understand	CO 3	CLO 6
2	Differentiate between the data and temporal dependencies and its effect	Remember	CO 3	CLO 6
3	Explain priority – Driven scheduling approach for real –time systems with an example.	Understand	CO 3	CLO 6
4	Write the distinctions function, ISR and task	Understand	CO 3	CLO 6

S.No	QUESTION	Blooms Taxonomy level	Course Outcomes	Course Learning Outcomes
5	Write the basic design principles when using an RTOS to design an embedded system.	Understand	CO 3	CLO 7
UNIT-IV				
EXCEPTIONS , INTERRUPTS AND TIMERS				
Part - A (Short Answer Questions)				
S.No	QUESTION	Blooms taxonomy level	Course Outcomes	Course Learning Outcomes
1	What are Exceptions?	Understand	CO 4	CLO 8
2	What are interrupts?	Understand	CO 4	CLO 8
3	What are the applications of interrupts?	Remember	CO 4	CLO 8
4	What is spurious interrupts ?	Remember	CO 4	CLO 8
5	What is real time clock?	Remember	CO 4	CLO 8
6	What is a programmable timers?	Remember	CO 4	CLO 8
7	What are timer interrupts?	Remember	CO 4	CLO 9
8	What are soft timers?	Remember	CO 4	CLO 9
9	What is interrupt timer routines ?	Remember	CO 4	CLO 9
10	What are the timer operations?	Remember	CO 4	CLO 9
11	What are soft timers?	Understand	CO 4	CLO 8
12	What is interrupt timer routines ?	Remember	CO 4	CLO 8
13	What are the timer operations?	Remember	CO 4	CLO 8
Part – B (Long Answer Questions)				
1	What are exceptions and interrupts? Explain the applications of exceptions and interrupts.	Understand	CO 4	CLO 8
2	Explain the steps in servicing the timer interrupt	Understand	CO 4	CLO 8
3	(a) Explain the following (i) Timing wheels (ii) Nested exceptions	Understand	CO 4	CLO 8
4	Write about weighted round-robin approach for scheduling real-time systems with an example	Understand	CO 4	CLO 8
5	Explain the Interrupt service routines in an RTOS	Understand	CO 4	CLO 8
6	Explain the exceptions and what is the process of handling exceptions?	Remember	CO 4	CLO 8
7	Explain the interrupts, spurious interrupts with examples	Remember	CO 4	CLO 9
8	Explain the real time clocks with examples	Remember	CO 4	CLO 9
9	Differentiate the programmable timer interrupts and timer interrupt service routine?	Understand	CO 4	CLO 9
10	What are the applications of exceptions and interrupts in RTOS	Understand	CO 4	CLO 9
Part - C (Analytical Questions)				
S.No	QUESTION	Blooms taxonomy level	Course Outcomes	Course Learning Outcomes
1	Discuss the phases of periodic tasks in time services.	Understand	CO 4	CLO 8
2	What is fixed priority scheduling? Explain with example.	Remember	CO 4	CLO 8
3	Differentiate the weighted Round Robin and Priority driven approaches?	Remember	CO 4	CLO 9
4	Explain the inter-process communication of RTOS.	Remember	CO 4	CLO 9
5	Describe the Hardware and Software interrupt priorities.	Remember	CO 4	CLO 9

S.No	QUESTION	Blooms Taxonomy level	Course Outcomes	Course Learning Outcomes
UNIT-V				
CASE STUDIES OF RTOS				
Part - A (Short Answer Questions)				
1	What is RT Linux ?	Remember	CO 5	CLO 10
2	Write about RTOS mCOS –II?	Remember	CO 5	CLO 10
3	Write about Micro C/OS-II	Understand	CO 5	CLO 10
4	What is embedded Linux	Remember	CO 5	CLO 10
5	What is the difference between normal OS and tiny OS?	Understand	CO 5	CLO 11
6	What are the basic concepts of android OS	Understand	CO 5	CLO 11
7	What is the difference between RTOS and android OS	Understand	CO 5	CLO 11
8	What is software and hardware architecture of a system	Understand	CO 5	CLO 12
9	Examples of vx works	Understand	CO 5	CLO 12
10	What is Vx works	Understand	CO 5	CLO 12
11	What is Vx works	Understand	CO 5	CLO 12
12	What is Windows NT?	Understand	CO 5	CLO 12
13	What is VRTX	Understand	CO 5	CLO 12
Part – B (Long Answer Questions)				
1	What are the important features of Vx Works for a sophisticated RTOS	Understand	CO 5	CLO 10
2	Define porting of RT Linux .Discuss general requirements of processor to port RT Linux along with hardware/software architecture	Understand	CO 5	CLO 10
3	Explain the following (i) Memory layout in Vx Works (ii) Task Priority levels in Vx Works	Understand	CO 5	CLO 10
4	Write and explain the coding for sending application layer byte stream on a TCP/IP network using RTOS Vx works	Remember	CO 5	CLO 10
5	Illustrate the block diagram of Automatic Chocolate Vending Machine System(ACVM)	Remember	CO 5	CLO 11
6	Explain all the specifications of Hardware architecture of ACVM system.	Remember	CO 5	CLO 11
7	Draw and explain the architecture for Air Traffic Control(ATC).	Understand	CO 5	CLO 11
8	Illustrate two examples for RTOS Image Processing.	Understand	CO 5	CLO 12
9	Define porting of RT Linux .Discuss general requirements of processor to port RT Linux along with hardware/software architecture	Understand	CO 5	CLO 12
10	Hardware and software architecture of the system Write the application software for the system	Remember	CO 5	CLO 12
Part - C (Analytical Questions)				
1	Write short notes on: a) Hard and soft real time systems. b) Offline and Online scheduling mechanism.	Understand	CO 5	CLO 10
2	Write about basic features of Vx works. Write about system – level functions of MUCOS.	Understand	CO 5	CLO 10
3	Give the overview of RT Linux.	Understand	CO 5	CLO 11
4	Explain Mutex management.	Remember	CO 5	CLO 11
5	Distinguish between the features of MUCOS and Vx Works RTOS.	Remember	CO 5	CLO 12