INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

Course Title	**EMBEDDED SYSTEMS DESIGN**		
Course Code	BESB01		
Programme	M. Tech		
Semester	I	ECE	
Course Type	Core		
Regulation	IARE - R18		
Course Structure	**Theory**		
	Lectures	**Tutorials**	**Credits**
	3	-	3
Chief Coordinator	Ms. K Sravani, Assistant Professor		

COURSE OBJECTIVES:

I	Introduce the difference between embedded systems and general purpose systems
II	Optimize hardware designs of custom single-purpose processors
III	Compare different approaches in optimizing general-purpose processors
IV	Introduce different peripheral interfaces to embedded systems.

COURSE OUTCOMES:

CO 1	Understand the basic concepts of embedded system and various applications and characteristics system design of embedded system design and Quality Attributes of Embedded Systems.
CO 2	Classify the different types of processors and compare them and remember the definitions of ASICs, PLDs, memory, memory interface. Communication Interface.
CO 3	Applying the blocks and different circuits and Embedded Firmware Design Approaches and Development Languages.
CO 4	Understand Operating System Basics, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.
CO 5	Understand Task Communication Synchronization Issues, Task Synchronization Techniques, Device Drivers, analyze RTOS.

COURSE LEARNING OUTCOMES:

CLO Code	At the end of the course, the student will have the ability to
BESB01.01	Demonstrate to understand the definition and comparison of embedded system with other systems
BESB01.02	Explain to understand the history embedded system, Classify the embedded systems.
BESB01.03	List out the application areas of embedded systems Understand the purpose of the embedded systems.
BESB01.04	Understand the concepts of the characteristics and quality attributes.
BESB01.05	Classify the different types of processors and compare them and Remembering the definitions of ASICs, PLDs.
BESB01.06	Concept of COTS and Explain the memory shadowing, memory selection.
BESB01.07	Communication Interface: Onboard and External Communication Interfaces.
BESB01.08	Applying the different blocks and different circuits.
BESB01.09	Applying the embedded firmware design approaches and development languages.
BESB01.10	Remembering the basics of operating system and types of operating systems.
BESB01.11	Understanding the definitions of task, threads
BESB01.12	Analyze the multiprocessing, multi tasking, task scheduling
BESB01.13	Understanding Task Communication.
BESB01.14	Analyze the Task Synchronization, issues and techniques.
BESB01.15	Analyze Real Time Operating System and how to choose RTOS.

TUTORIAL QUESTION BANK

MIDTERM-I				
UNIT-I INTRODUCTION TO EMBEDDED SYSTEMS				
PART- A (SHORT ANSWER QUESTIONS)				
S. No	**QUESTION**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes**
1	Define a system with an example?	Understand	CO1	BESB01.01
2	Discuss briefly about an embedded system?	Understand	CO1	BESB01.01
3	Write the advantages of embedded system?	Understand	CO1	BESB01.05
4	Write the disadvantages of embedded system?	Remember	CO1	BESB01.05
5	Give the applications of an embedded system?	Understand	CO1	BESB01.04
6	Describe various classifications of embedded systems	Remember	CO1	BESB01.03
7	Give two essential units of a processor on an embedded system?	Understand	CO1	BESB01.05
8	Analyze the execution unit of a processor in an embedded system do?	Understand	CO1	BESB01.05
9	Give the classification of embedded system?	Remember	CO1	BESB01.03
10	Discuss the various embedded system requirements?	Understand	CO1	BESB01.03

11	Give examples for small scale embedded systems?	Understand	CO1	BESB01.03
12	Give examples for medium scale embedded systems?	Understand	CO1	BESB01.03
13	Give examples for large scale embedded systems?	Remember	CO1	BESB01.03
14	Define is the operational quality attribute?	Understand	CO1	BESB01.06
15	Define is the non-operational quality attribute?	Understand	CO1	BESB01.06
PART – B (LONG ANSWER QUESTIONS)				
1	What is an embedded system? Explain the different applications of embedded systems?	Understand	CO1	BESB01.01
2	List out and discuss in detail about the different classifications of embedded systems. Give an example for each?	Understand	CO1	BESB01.03
3	Discuss in detail about different characteristics of embedded systems with related examples.	Remember	CO1	BESB01.06
4	Explain quality attribute in the embedded system development context?	Understand	CO1	BESB01.06
5	Define operational quality attribute? Explain the important operational quality attributes to be considered in any embedded system design?	Understand	CO1	BESB01.06
6	Define non-operational quality attribute? Explain the important operational quality attributes to be considered in any embedded system?	Understand	CO1	BESB01.06
7	Discuss in detail about the quality attribute Response in the embedded system design context?	Remember	CO1	BESB01.06
8	Describe the quality attribute Throughput in the embedded system design context?	Understand	CO1	BESB01.06
9	Explain the quality attribute Reliability in the embedded system design context?	Remember	CO1	BESB01.06
10	Discuss in detail about the quality attribute information security in the embedded system design context?	Understand	CO1	BESB01.06
11	Explain the quality attribute portability in the embedded system design context?	Remember	CO1	BESB01.06
PART - C (PROBLEM SOLVING & ANALYTICAL QUESTIONS)				
1	Give examples for general purpose processor? And explain in detail about processor?	Remember	CO1	BESB01.03
2	Describe embedded cores?	Understand	CO1	BESB01.01
3	Explain the real life example on the bonding of embedded technology with human life?	Understand	CO1	BESB01.04
4	Discuss about the product life cycle of an embedded product development?	Remember	CO1	BESB01.04
UNIT-II TYPICAL EMBEDDED SYSTEM				
PART – A (SHORT ANSWER QUESTIONS)				
1	Describe the components used as the core of an embedded system?	Understand	CO 2	BESB01.07
2	Give the difference between microprocessor and microcontroller?	Understand	CO 2	BESB01.11
3	Define the processor architecture?	Remember	CO 2	BESB01.07
4	Define programmable logic device?	Understand	CO 2	BESB01.08

5	Write the difference between RISC and CISC processors?	Understand	CO 2	BESB01.07
6	Write the difference between PLD and ASIC?	Remember	CO 2	BESB01.08
7	Write the difference between masked ROM and OTP?	Understand	CO 2	BESB01.10
8	Discuss the different types of RAM used for embedded system design?	Understand	CO 2	BESB01.10
9	Define SRAM cell?	Remember	CO 2	BESB01.10
10	Define DRAM cell?	Understand	CO 2	BESB01.10
11	Define Relay? What are the different types of relays are available?	Understand	CO 2	BESB01.10
12	Define is PPI device?	Remember	CO 2	BESB01.10
13	Write is the difference between I2C and SPI communication interface?	Understand	CO 2	BESB01.11
14	Write the merits and limitations of the RS232 interface?	Understand	CO 2	BESB01.11
PART – B (LONG ANSWER QUESTIONS)				
1	List out and Discuss in detail about the components of typical embedded systems.	Understand	CO 2	BESB01.07
2	Which are the components used as the core of an embedded systems? Explain the merits and drawbacks?	Remember	CO 2	BESB01.07
3	What is the difference between microprocessor and microcontroller? Explain the role of microprocessors and Microcontrollers in embedded systems?	Understand	CO 2	BESB01.07
4	Define digital signal processing (DSP)? Explain the role of DSP in embedded system design?	Remember	CO 2	BESB01.11
5	What is processor architecture? What is the different processor architectures available processor/controller design? Give an example	Understand	CO 2	BESB01.07
6	What is programmable logic device? What are different types of PLDs? Explain the role of PLDs in embedded system design?	Remember	CO 2	BESB01.08
7	What are the different types of memories used in embedded systems design? Explain the role of each?	Understand	CO 2	BESB01.10
8	List out the different types of memories used for program storage in embedded systems design?	Remember	CO 2	BESB01.10
9	Classify the advantages of FLASH over other program storage memory in Embedded system design?	Understand	CO 2	BESB01.10
10	Define sensor? Explain its role in embedded system design? Illustrate with an example?	Understand	CO 2	BESB01.11
11	Define actuator? Explain its role in embedded system design? Illustrate with an example?	Remember	CO 2	BESB01.11
12	Explain the different factor that needs to be considering in the selection of memory for embedded system?	Understand	CO 2	BESB01.10
13	What are differences between general purpose processor and application specific instruction set processors with an example?	Remember	CO 2	BESB01.07
14	i. Explain the on different onboard communication interface in brief? ii. Explain the on different external communication interface in brief?	Understand	CO 2	BESB01.11
15	Explain the sequence of operation for communicating with an I2C slave device?	Remember	CO 2	BESB01.11
16	Explain in detail about RS-232 serial interface?	Remember	CO 2	BESB01.11
PART - C (PROBLEM SOLVING &ANALYTICAL QUESTIONS)				

1	Draw the interfacing diagram for connecting an LED to the port pin of a microcontroller. The LED is turned ON when the microcontroller port pin is at Logic 0.	Understand	CO 2	BESB01.11
2	Explain the sequence of operation for communicating with 1 wire slave device.	Remember	CO 2	BESB01.11
3	Write a ALP program to interface 7 segment LED display to microcontroller 8051?	Understand	CO 2	BESB01.11
4	Write a ALP program to interfacing matrix keyboard to microcontroller 8051?	Remember	CO 2	BESB01.11
UNIT-III EMBEDDED FIRMWARE				
PART - A (SHORT ANSWER QUESTIONS)				
1	Define Assembly Level Language?	Remember	CO 3	BESB01.12
2	Discuss about format of the assembly level language?	Remember	CO 3	BESB01.12
3	What is absolute object file?	Understand	CO 3	BESB01.12
4	Write the difference between compiler and cross compiler?	Understand	CO 3	BESB01.12
5	Define inline assembly?	Understand	CO 3	BESB01.12
6	Give the limitations of the high level language based development?	Remember	CO 3	BESB01.12
7	Write short notes on Linker and Locater?	Understand	CO 3	BESB01.12
8	Discuss about the object to hex file converter?	Remember	CO 3	BESB01.12
9	Define embedded firmware?	Understand	CO 3	BESB01.13
10	Define super loop model design in embedded firmware design?	Understand	CO 3	BESB01.13
11	Discuss briefly about approachment of embedded operating system?	Understand	CO 3	BESB01.13
12	What is mean by mnemonics? Give the example?	Remember	CO 3	BESB01.13
MID TERM-II				
13	Distinguish between the assembly language and machine language?	Understand	CO 3	BESB01.13
14	What are the assembler directive instructions? Give example?	Remember	CO 3	BESB01.13
15	List out the drawbacks of the assembly language based development?	Understand	CO 3	BESB01.13
16	What is the process to perform the translation of assembly to machine code?	Remember	CO 3	BESB01.13
17	Define the functionality of cross compiler conversion?	Understand	CO 3	BESB01.13
18	What are the steps are require in firmware execution flow?	Remember	CO 3	BESB01.13
19	Give the examples of RTOS employed in embedded product development?	Understand	CO 3	BESB01.13
20	Define Watch Dog Timer?	Understand	CO 3	BESB01.12
21	Write brief notes on Library file creation and usage?	Understand	CO 3	BESB01.12
22	Define general purpose operating system? Give the example.	Understand	CO 3	BESB01.12
23	Define RTOS? Give the example?	Understand	CO 3	BESB01.12
25	Compare between the assembly level and high level languages based development?	Understand	CO 3	BESB01.12
26	Compare between the mixing assembly with high level and mixing high level languages with assembly?	Remember	CO 3	BESB01.12

	PART- B (LONG ANSWER QUESTIONS)			
1	What is embedded firmware? What are the different approaches available for embedded firmware development?	Understand	CO 3	BESB01.13
2	Define RESET Circuit? Explain the role of RESET circuit in embedded system.	Remember	CO 3	BESB01.12
3	Explain the functionality and role of Real Time Clock.	Understand	CO 3	BESB01.12
4	Discuss in detail about the functionality and role of Watch dog Timer in embedded system.	Remember	CO 3	BESB01.12
5	Explain the functionality and role of Brown out protection circuit in embedded system.	Understand	CO 3	BESB01.12
	MID TERM-II			
6	Explain the various steps involved in the assembling of an assembly language program?	Remember	CO 3	BESB01.13
7	Explain the advantages of Assembly level language based on embedded firmware development?	Understand	CO 3	BESB01.13
8	Determined the high level language based on embedded firmware development technique?	Remember	CO 3	BESB01.13
9	Discuss about source file to object file translation in the assembly language based development?	Understand	CO 3	BESB01.13
10	Explain about library file creation and usage in the assembly language based development?	Remember	CO 3	BESB01.13
11	Write the advantages and drawbacks of assembly language based development?	Understand	CO 3	BESB01.13
12	Write the advantages and limitations of high language based development?	Remember	CO 3	BESB01.13
	PART – C (PROBLEM SOLVING &ANALYTICAL QUESTIONS)			
1	Give the examples for situations demanding mixing of C with assembly? Explain the techniques for mixing of C with assembly?	Understand	CO 3	BESB01.13
2	Give the examples for situations demanding mixing of assembly with C? Explain the techniques for mixing assembly with C?	Remember	CO 3	BESB01.13
	UNIT-IV **RTOS BASED EMBEDDED SYSTEM DESIGN**			
	PART- A (SHORT ANSWER QUESTIONS)			
1	What is an operating system?	Understand	CO 4	BESB01.14
2	Define kernel?	Remember	CO 4	BESB01.14
3	Discuss about kernel space and user space?	Understand	CO 4	BESB01.14
4	Define monolithic and micro kernel?	Remember	CO 4	BESB01.14
5	What is task control block?	Understand	CO 4	BESB01.16
6	Define virtual memory?	Remember	CO 4	BESB01.14
7	Discuss how accurate time management is achieved in real time kernel?	Understand	CO 4	BESB01.14
8	Explain process life cycle?	Remember	CO 4	BESB01.14
9	Define process control block?	Understand	CO 4	BESB01.14
10	Analyze how threads and process are related?	Remember	CO 4	BESB01.15
11	Give the difference between threads and process in detail?	Understand	CO 4	BESB01.16
12	Give the comparison between multitasking, multiprogramming, multi processing?	Remember	CO 4	BESB01.16

13	Discuss all activates are involved in the context switching?	Understand	CO 4	BESB01.15
14	Define task scheduling?	Remember	CO 4	BESB01.15
15	Explain the different queues are associated with process scheduling?	Understand	CO 4	BESB01.15
PART – B (LONG ANSWER QUESTIONS)				
1	Define kernel? What are the different functions handled by a general purpose kernel?	Understand	CO 4	BESB01.14
2	What is the difference between a general purpose kernel and real time kernel? Give an example for both?	Remember	CO 4	BESB01.14
3	Explain the difference between memory management of general purpose kernel and real time kernel?	Understand	CO 4	BESB01.14
4	Determined the how accurate time management is achieved in real time kernel?	Remember	CO 4	BESB01.14
5	Discuss in detail about the TASK and Process in the operating system	Understand	CO 4	BESB01.15
6	Discuss in detail about the memory architecture of a process?	Remember	CO 4	BESB01.15
7	Explain various activities involved in the creation of process and threads?	Understand	CO 4	BESB01.15
8	What is process control block (PCB)? Explain the structure of the PCB	Remember	CO 4	BESB01.15
9	What is task control block (TCB)? Explain the structure of the TCB	Understand	CO 4	BESB01.15
10	Discuss in detail about how Threads and process are related? What are the common to process and threads?	Remember	CO 4	BESB01.15
11	Determine how multithreading can improve the performance of an application with an illustrative example?	Understand	CO 4	BESB01.16
12	Discuss in detail about thread context switch and the various activities performed in thread context switching for user level and kernel level Threads	Understand	CO 4	BESB01.15
13	List out the all activities are involved in context switching? Explain each one individually?	Remember	CO 4	BESB01.15
14	Determined the different multitasking models in the operating system context?	Understand	CO 4	BESB01.16
15	List out the various factors to be considered for the selection of scheduling criteria?	Remember	CO 4	BESB01.15
16	List out the different types of non-preemptive scheduling algorithms? State the merits and demerits of each?	Understand	CO 4	BESB01.15
17	Explain the different types of preemptive scheduling algorithms? State the merits and demerits of each?	Remember	CO 4	BESB01.15
18	Discuss in detail about Explain Round Robin (RR) process scheduling with interrupts?	Understand	CO 4	BESB01.15
19	Explain starvation in the process scheduling context? Explain how it can be effectively tackled?	Understand	CO 4	BESB01.15
20	Define IDLE PROCESS? What is the significance of it in the process scheduling context?	Remember	CO 4	BESB01.15
PART - C (PROBLEM SOLVING &ANALYTICAL QUESTIONS)				
1	What is the difference between Hard and Soft real time systems? Give an example for Hard and Soft real time kernels?	Understand	CO 4	BESB01.14
2	Explain how Threads and process are related? What are the common to process and threads?	Remember	CO 4	BESB01.15
UNIT- V				

TASK COMMUNICATION				
PART - A (SHORT ANSWER QUESTIONS)				
1	Define deadlock?	Understand	CO 5	BESB01.17
2	Discuss about Coffman conditions?	Understand	CO 5	BESB01.17
3	Discuss about the different methods of handling deadlocks?	Remember	CO 5	BESB01.17
4	Give the difference between buffer over run and buffer under run?	Understand	CO 5	BESB01.17
5	Define task synchronization?	Remember	CO 5	BESB01.18
6	Give the difference between mutex and semaphores?	Understand	CO 5	BESB01.17
7	Analyze the critical section problem?	Remember	CO 5	BESB01.18
8	Define device driver?	Understand	CO 5	BESB01.18
9	Discuss about the sleep and wakeup mechanism for mutual exclusion.	Remember	CO 5	BESB01.18
10	What is Inter process communication?	Understand	CO 5	BESB01.17
11	What is mean by test and set lock?	Understand	CO 5	BESB01.17
12	Define semaphore?	Understand	CO 5	BESB01.17
13	Define message passing?	Understand	CO 5	BESB01.17
14	Define shared memory?	Remember	CO 5	BESB01.19
15	What is mean by remote procedure call?	Understand	CO 5	BESB01.19
PART – B (LONG ANSWER QUESTIONS)				
1	Explain the various process interaction models in detail?	Understand	CO 5	BESB01.19
2	What is inter process communication (IPC)? Give an overview of different IPC mechanisms adopted by various operating systems?	Remember	CO 5	BESB01.17
3	Determined The message passing technique for IPC. What are the merits and demerits of message based IPC?	Understand	CO 5	BESB01.17
4	Explain the synchronous and asynchronous messaging mechanisms for IPC under windows kernel?	Remember	CO 5	BESB01.18
5	Define priority inversion? What are the different techniques adopted for handling priority inversion?	Understand	CO 5	BESB01.17
6	Explain the different task communication synchronization issues encountered in inter process communication?	Remember	CO 5	BESB01.17
7	Determined the mutual exclusion in the process synchronization context? Explain the different mechanisms for mutual exclusion?	Understand	CO 5	BESB01.18
8	Explain the interlocked functions for locked based mutual under windows OS.	Remember	CO 5	BESB01.19
9	What is semaphore? Explain the different types of semaphores. Where it is used?	Understand	CO 5	BESB01.17
10	Explain the semaphore based process synchronization under windows OS	Remember	CO 5	BESB01.18
11	What is critical section? What are the different techniques for controlling access to critical section?	Understand	CO 5	BESB01.19
12.	Discuss in detail about the event and event object based synchronization mechanism for IPC Windows OS.	Understand	CO 5	BESB01.18

PART – C (PROBLEM SOLVING &ANALYTICAL QUESTIONS)				
1	Discuss in detail about the critical section object for process synchronization? Why critical section object is based synchronization	Understand	CO 5	BESB01.18
2	Explain the different functional and non-functional requirements that need to be evaluated in the selection of RTOS.	Remember	CO 5	BESB01.19

Prepared by:
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