



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

INFORMATION TECHNOLOGY TUTORIAL QUESTION BANK

Course Name	:	EMBEDDED SYSTEMS DESIGN
Course Code	:	AEC551
Class	:	B. Tech VI Semester
Branch	:	IT
Academic Year	:	2018-2019
Course Coordinator	:	Mr. N Nagaraju, Assistant Professor, ECE
Course Faculty	:	Mr. N Nagaraju, Assistant Professor, ECE

COURSE OBJECTIVES:

The course should enable the students to:

S. NO	DESCRIPTION
I	Imbibe knowledge about the basic functions, structure, concepts and applications of Embedded Systems.
II	Understand Real time operating system concepts.
III	Analyze different tools for development of embedded software.
IV	Understand the architecture of advanced processors.

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

AEC551.01	Understand the basic concept of embedded systems.
AEC551.02	Analyze the applications in various domains of embedded system.
AEC551.03	Develop embedded system development process and tools.
AEC551.04	Remember the concepts of microcontroller, and core of embedded system.
AEC551.05	Discuss the memory interface and assembly language programming process.
AEC551.06	Examine the counters and timers of 8051 microcontroller.
AEC551.07	Recall the embedded C programming in Keil IDE, and compiling.
AEC551.08	Interpret different concepts of display and keyboard interfacing using embedded C.
AEC551.09	Understand different concepts of serial communication using embedded C.
AEC551.10	Remember the RTOS concepts for firmware development.
AEC551.11	Examine the host and target machines for linking to embedded software.
AEC551.12	Develop debugging techniques for testing on host machine.
AEC551.13	Understand the advanced processors such as ARM and SHARC.
AEC551.14	Discuss the bus protocols such as I2C and CAN bus.
AEC551.15	Design an application based on advanced technological changes.

TUTORIAL QUESTION BANK

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
UNIT-I			
EMBEDDED COMPUTING			
PART-A (SHORT ANSWER QUESTIONS)			
1	Define an embedded system.	Understand	AEC551.01
2	Distinguish between embedded system vs general purpose system.	Understand	AEC551.01
3	Demonstrate any four application areas of embedded systems.	Understand	AEC551.01
4	List out classification embedded systems based on generation.	Remember	AEC551.01
5	Discuss in briefly the history of embedded systems.	Understand	AEC551.02
6	Outline the classification of embedded systems based on triggering	Remember	AEC551.02
7	Demonstrate the brake and stability control system of automobile example.	Understand	AEC551.02
8	List out classification embedded systems based on complexity and performance requirements	Remember	AEC551.02
9	List the steps in embedded system design process	Understand	AEC551.02
10	Explain classification of embedded systems based on deterministic behavior.	Remember	AEC551.02
PART-B (LONG ANSWER QUESTIONS)			
1	Interpret the requirements for an embedded system design process.	Understand	AEC551.01
2	Explain automatic chocolate vending machine with neat diagram.	Remember	AEC551.01
3	Explicate briefly formalism for the system design.	Understand	AEC551.02
4	Discuss the specifications for an embedded system design process.	Remember	AEC551.01
5	Examine the classification of embedded systems based on generation with examples.	Understand	AEC551.02
6	Demonstrate the digital camera application with neat diagram.	Understand	AEC551.02
7	Examine the architecture for an embedded system design process.	Understand	AEC551.02
8	Explain classification embedded systems based on complexity and performance requirements.	Understand	AEC551.02
9	Analyze the components for an embedded system design process.	Understand	AEC551.02
10	Describe major application areas of an embedded system with examples.	Understand	AEC551.02
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	Briefly describe the distinction between requirements and specification	Understand	AEC551.02
2	Briefly describe the distinction between specification and architecture	Understand	AEC551.02
3	At what stage of the design methodology would we determine what type of CPU to use (8-bit vs. 16-bit vs. 32-bit, which model of a particular type of CPU, etc.)?	Remember	AEC551.02
4	At what stage of the design methodology would we choose a programming language?	Understand	AEC551.02
5	At what stage of the design methodology would we test our design for functional correctness?	Understand	AEC551.02
6	Compare and contrast top-down and bottom-up design.	Understand	AEC551.02
7	Provide a concrete example of how bottom-up information from the software programming phase of design may be useful in refining the architectural design.	Understand	AEC551.02

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
8	Create a UML state diagram for the <i>issue-command()</i> behavior of the <i>Controller</i> class	Remember	AEC551.02
9	Draw a class diagram for the classes required in a basic microwave oven. The system should be able to set the microwave power level between 1 and 9 and time a cooking run up to 59 min and 59 s in 1-s increments. Include * classes for the physical interfaces to the telephone line, microphone, speaker, and buttons.	Understand	AEC551.02
10	<p>Show how a <i>Set-speed</i> command flows through the refined class structure described in Figure</p> <pre> classDiagram class Console class Panel class Formatter class Transmitter class Knobs* class Train class Receiver class Controller class MotorInterface class Detector* class Pulsar* class TrainSet Console "1" -- "1" Panel Console "1" -- "1" Formatter Console "1" -- "1" Transmitter Panel "1" -- "1" Knobs* Transmitter "1" -- "1" Sender* Train "1" -- "1..t" TrainSet Train "1" -- "1" Receiver Train "1" -- "1" Controller Train "1" -- "1" MotorInterface Receiver "1" -- "1" Detector* MotorInterface "1" -- "1" Pulsar* </pre> <p>moving from a change on the front panel to the required changes on the train:</p> <p>a. Show it in the form of a collaboration diagram. b. Show it in the form of a sequence diagram.</p>	Understand	AEC551.02

UNIT-II

THE 8051 ARCHITECTURE

PART-A(SHORT ANSWER QUESTIONS)

1	Write the differences between microprocessor and microcontroller.	Remember	AEC551.05
2	Discuss which ports of 8051 are bit addressable.	Understand	AEC551.05
3	Explain why Port 0 needs pull-up resistors.	Remember	AEC551.05
4	List out the types of addressing modes in microcontroller.	Remember	AEC551.05
5	Interpret 8051 series has how many 16 bit registers?	Understand	AEC551.05
6	When the microcontroller executes some arithmetic operations, then the flag bits of which register are affected.	Understand	AEC551.05
7	How are the bits of the register PSW affected if we select Bank2 of 8051?	Understand	AEC551.04
8	How many timers are in 8051? Specify their names.	Remember	AEC551.05
9	What is the function of C/T bit in TMOD register?	Understand	AEC551.06
10	Discuss the functionality of TF0 bit in TCON register.	Understand	AEC551.06

PART-B (LONG ANSWER QUESTIONS)

1	Explain the block diagram of 8051 Microcontroller.	Remember	AEC551.06
2	What are registers in Microcontroller and explain in brief.	Understand	AEC551.06
3	Define an interrupt? List various types of interrupts available in 8051 Microcontroller.	Understand	AEC551.04
4	Describe about the stack pointer in 8051 microcontroller?	Understand	AEC551.06
5	Explain the Architecture of 8051.	Remember	AEC551.06
6	List out 8051 microcontroller applications in embedded systems.	Understand	AEC551.06
7	With the diagram explain how 8051 interfaced to external memory.	Understand	AEC551.04
8	Inspect the features of 8051 Microcontroller.	Remember	AEC551.06

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9	What is the function of SMOD in PCON register?	Understand	AEC551.06
10	Mention any four addressing modes of 8051.	Understand	AEC551.04
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	Examine the various modes of timer operation with diagram.	Remember	AEC551.06
2	Discuss about TCON register.	Understand	AEC551.06
3	Explain the functions of each bit of SCON register.	Understand	AEC551.06
4	Describe the steps to program the timer 1 in mode 2.	Understand	AEC551.06
5	Demonstrate in detail about the programming of 8051 timer.	Remember	AEC551.06
6	Mention the functions of each bit of PCON register.	Understand	AEC551.06
7	Write a program to place the number 53H in internal RAM locations 30H to 32H.	Understand	AEC551.04
8	Write a program to exchange the contents of the SP and the PSW	Remember	AEC551.04
9	Write a program to swap the bytes in timer 0; put TL0 in TH0 and TH0 in TL0.	Understand	AEC551.04
10	Write a program to PUSH the contents of the B register to TMOD.	Understand	AEC551.05
UNIT-III			
INTRODUCTION TO EMBEDDED C AND APPLICATIONS			
CIE-I			
PART-A(SHORT ANSWER QUESTIONS)			
1	What is meant by term embedded C.	Remember	AEC551.07
2	Examine the header file.	Remember	AEC551.07
3	Demonstrate the addresses of the byte registers.	Understand	AEC551.07
4	Discuss about code editor?	Understand	AEC551.07
5	List the P0 bit registers addresses.	Remember	AEC551.07
6	Explain compiler and cross compiler.	Understand	AEC551.07
7	Demonstrate assembler and cross assembler.	Understand	AEC551.07
8	List out the PCON register bit values.	Understand	AEC551.07
9	Discuss about disassembly.	Understand	AEC551.07
10	List the TCON bit registers addresses.	Understand	AEC551.07
CIE-II			
1	Sketch the diagram of keyboard interfacing.	Understand	AEC551.08
2	Draw the diagram of display interfacing.	Remember	AEC551.08
3	Sketch the diagram of D/A interfacing.	Understand	AEC551.08
4	Draw the diagram of A/D interfacing.	Remember	AEC551.08
5	Basic techniques for reading from I/O port pins.	Understand	AEC551.08
6	List out the techniques for writing from I/O port pins.	Understand	AEC551.08
7	What TxD will do in keyboard interfacing?	Remember	AEC551.09
8	Give the pin RxD functionality in keyboard interfacing?	Remember	AEC551.09
9	What PWR will do in DAC interfacing?	Understand	AEC551.09
10	What is the purpose of sample and hold amplifier circuit in ADC interfacing?	Understand	AEC551.09
PART-B(LONG ANSWER QUESTIONS)			
1	Discuss the initial steps of embedded program development.	Understand	AEC551.07
2	Explain the Keil IDE briefly.	Remember	AEC551.07
3	Examine the builder with block diagram.	Understand	AEC551.07
4	Interpret the linker in detail.	Remember	AEC551.07
5	Demonstrate the emulator and in circuit emulator.	Understand	AEC551.07
6	Discuss the hardware simulator.	Understand	AEC551.07
7	What are the items included in ISP.	Remember	AEC551.07
8	Write a program which gives values to port pins.	Understand	AEC551.07
9	Write a program toggles P0 continuously between values of 0 and 0xFF.	Understand	AEC551.07

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
10	Write a program in which P2 is given two different values. The values should be passed to P2 with a delay.	Understand	AEC551.07
CIE-II			
1	Demonstrate the keyboard interfacing	Remember	AEC551.09
2	Examine the purpose of writing from I/O port pins	Understand	AEC551.09
3	Interpret the of DAC interfacing	Understand	AEC551.09
4	How to interface seven segment display with 8051 microcontroller	Understand	AEC551.09
5	Explain for reading from I/O port pins	Remember	AEC551.08
6	Discuss the bouncer and debouncer in keyboard interfacing	Understand	AEC551.08
7	Explain scan clock in keyboard interfacing for 8051	Remember	AEC551.08
8	Demonstrate the LED display interfacing for 8051	Understand	AEC551.08
9	Explain the ADC interfacing	Understand	AEC551.08
10	Illustrate the integrator circuit in DAC interfacing	Remember	AEC551.08
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	Write a program to toggle P2.2 with a delay between the states.	Understand	AEC551.07
2	Construct a program where the contents of the character array ARRAY are sent to Port0 one after the other repeatedly.	Remember	AEC551.07
3	Write a program which writes a message to an output port.	Understand	AEC551.07
4	Construct a program to create an unsymmetrical square wave at P1.4	Understand	AEC551.07
5	Write a program for timer0 under mode-2.	Remember	AEC551.07
6	Construct a program for the event that occurs is the complementing of pin P2.4	Understand	AEC551.07
7	Write a where timer0 and timer1 are used and two square waves are simultaneously obtained at two output pins P2.0 and P2.1	Remember	AEC551.07
8	Construct a program to perform logical and shift operations.	Understand	AEC551.07
9	Write a program for serial communication.	Understand	AEC551.07
10	Construct a program for getting timer1 to act as a ring counter at PortB.	Understand	AEC551.07
CIE-II			
1	Write a program for interfacing ADC with 8051.	Understand	AEC551.08
2	Construct a program for interfacing Keypad with 8051 microcontroller using Keil C.	Understand	AEC551.08
3	Write a program for interfacing LED with 8051.	Remember	AEC551.08
4	Construct a program for interfacing seven segments with 8051.	Understand	AEC551.08
5	Write a program for LCD interfacing with 8051.	Understand	AEC551.08
UNIT-IV			
INTRODUCTION TO REAL – TIME OPERATING SYSTEMS			
PART-A (SHORT ANSWER QUESTIONS)			
1	Define process.	Remember	AEC551.10
2	Demonstrate task and Task state.	Understand	AEC551.10
3	Discuss about RTOS briefly.	Remember	AEC551.10
4	Define task and task rates.	Understand	AEC551.11
5	Summarize CPU scheduling.	Understand	AEC551.11
6	Outline about Semaphore.	Understand	AEC551.11
7	Give the semaphore related functions.	Understand	AEC551.12
8	Define Message Queue.	Remember	AEC551.11
9	What is sophisticated multitasking embedded system?	Remember	AEC551.11
10	Name any two queue related functions for the inter task communications.	Remember	AEC551.10
PART-B (LONG ANSWER QUESTIONS)			
1	Outline how interrupt routines handled in embedded system.	Understand	AEC551.10
2	Explain the real time operating systems.	Understand	AEC551.10
3	Discuss about cyclic scheduling with time slicing	Understand	AEC551.10

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4	Describe about IPC in detail.	Understand	AEC551.10
5	Explain how thread and process are used in embedded system.	Remember	AEC551.11
6	Discuss about Interrupt Service Handling in RTOS.	Understand	AEC551.11
7	Write about Semaphores with types in detail.	Understand	AEC551.11
8	Demonstrate the state transition diagram of RTOS.	Remember	AEC551.11
9	Examine the scheduler in which RTOS insert into the list and the ready task for sequential execution in a co-operative round robin model.	Understand	AEC551.10
10	Explain process management and memory management in embedded system.	Remember	AEC551.12
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	Demonstrate the tools used to download the embedded software into the target system.	Understand	AEC551.10
2	Explain briefly about mailbox related functions.	Understand	AEC551.10
3	What are the rules to decide reentrancy of a function? Explain due to which rule the following function is not reentrant? int cErrors; void vcountErrors(int cNewError) { cErrors += cNewError; } Can this function be made reentrant by using semaphore? Justify.	Understand	AEC551.12
4	Discuss in detail the various scheduling policies with example.	Understand	AEC551.12
5	Describe round robin scheduling algorithm with suitable diagram.	Remember	AEC551.11
6	List scheduling algorithms of RTOS. Describe concept of Pre-emptive multitasking scheduling algorithm of RTOS with suitable diagram.	Understand	AEC551.11
7	State the methods of Task synchronization. Describe Semaphore with suitable example.	Understand	AEC551.11
8	Describe any 4 specifications of RTOS. Give any 4 examples of RTOS.	Remember	AEC551.11
9	Discuss the various debugging techniques and debugging challenges.	Understand	AEC551.12
10	Explain the multi-state systems and function sequences.	Understand	AEC551.12
UNIT-V			
INTRODUCTION TO ADVANCED ARCHITECTURES			
PART-A(SHORT ANSWER QUESTIONS)			
1	Discuss about I2C?	Understand	AEC551.14
2	What are the bits in I2C corresponding to?	Remember	AEC551.14
3	Explain about CAN bus? Where is it used?	Understand	AEC551.14
4	Describe about the instruction length of ARM processor	Understand	AEC551.13
5	Draw the data frame format of CAN?	Remember	AEC551.14
6	Discuss the address space in ARM processor?	Remember	AEC551.13
7	What are disadvantages of I2C?	Understand	AEC551.14
8	Demonstrate the important embedded processor chips?	Understand	AEC551.13
9	What are the two essential units of a processor on an embedded system?	Remember	AEC551.13
10	State the special features on I2C?	Remember	AEC551.13
PART-B(LONG ANSWER QUESTIONS)			
1	Write short notes on SHARC processor and Internet enabled system.	Understand	AEC551.13
2	Explain memory organization of ARM processor is different from conventional general purpose processors memory organization.	Remember	AEC551.13
3	Describe the problems faced in designing an RTOS. What techniques are used to overcome it?	Understand	AEC551.13

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
4	Compare and contrast ARM Bus and SHARC Bus.	Understand	AEC551.13
5	Describe ARM two stage address translation.	Remember	AEC551.13
6	Write a brief notes on CAN Bus architecture.	Understand	AEC551.14
7	Describe short note on I2C bus.	Understand	AEC551.14
8	Explain in detail instruction level parallelism.	Remember	AEC551.14
9	Discuss about serial communication programming.	Understand	AEC551.14
10	Write short notes on CAN bus protocol.	Remember	AEC551.14
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1.	List out Fixed point ALU operations in SHARC processor and explain.	Understand	AEC551.13
2	Discuss the general operation of a typical telegraph system in which network port and serial ports communicate via tasks for printing serial data received using DDP and ADSP protocol stack. Assume suitable data with a functional block diagram.	Remember	AEC551.13
3	Explain distributed embedded architectures and state why they are needed.	Remember	AEC551.14
4	Describe an I2C bus at the following OSI-compliant levels of detail: a) physical b) data link c) network d) transport	Understand	AEC551.13
5	Give hardware and software at functional level for designing elevator controller using basic design principles using a RTOS.	Understand	AEC551.13
6	Write two applications of ARM processor-based systems with functional block diagram for each application and explain its working.	Remember	AEC551.13
7	Write SHARC assembly code to first read and then write a device memory mapped to location 0x400110.	Remember	AEC551.13
8	Demonstrate the various architectural features of one of the SHARC processors of your choice with its functional block diagram.	Understand	AEC551.13

Prepared by:
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