INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Title	EMBEDDED SYSTEMS				
Course Code	AEC016				
Program	B.Tech				
Semester	SEVEN				
Course Type	Core				
Regulations	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	3	2
Chief Coordinator	Mr. S Lakshmanachari, Assistant Professor.				

COURSE OBJECTIVES:

The students will try to learn:	
I	The fundamental concepts of embedded computing, embedded C, RTOS and embedded software development tools for implementing of real time embedded systems.
II	The embedded C is required to develop the software for different applications of the embedded systems.
III	The basics of various development tools are necessary to develop an embedded software.
IV	The architecture and memory organization of advanced general purpose microprocessors and digital signal processors like ARM and SHARC.

COURSE OUTCOMES:

At the end of the course the students should be able to:

Course Outcomes		Knowledge Level (Bloom's Taxonomy)
CO 1	**Summarize** the applications of embedded systems in various domains.	Understand
CO 2	**Analyze** the embedded system design process, characteristics and quality attributes of an embedded system.	Analyze
CO 3	**Apply** the looping structure concept to the programming of embedded C.	Apply
CO 4	**Analyze** the concepts of interfacing modules using embedded C programming.	Analyze
CO 5	**Evaluate** the basic techniques used in interfacing in terms of reading and writing data from I/O port pins.	Evaluate

CO 6	**Develop** the embedded software using the basics and fundamentals of RTOS.	Apply
CO 7	**Demonstrate** the multiprocessing and multitasking in real time operating system to estimate the performance of embedded system.	Understand
CO 8	**Describe** the process of task communication using shared memory and message passing.	Apply
CO 9	**Illustrate** the implementation of real-time operating system using task communication and task synchronization.	Understand
CO 10	**List** the embedded software development tools for getting embedded software into the target system.	Remember
CO 11	**Describe** the concepts of advanced processors in terms of ARM and SHARC processors.	Understand
CO 12	**Explain** the memory organization and instruction level parallelism in advanced processors.	Understand

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO
MODULE-I				
1	Define a System.	The definition of a system is a set of rules, an arrangement of things, or a group of related things that work toward a common goal.	Remember	CO 1
2	Define general computing systems?	A general-purpose computer is one that, given the appropriate application and required time, should be able to perform most common computing tasks. The term is used to differentiate general purpose computers from other types, in particular the specialized embedded computers used in intelligent systems.	Remember	CO 1
3	Define embedded system?	An embedded system is an electronic/electro-mechanical system designed to perform a specific function and is a combination of both hardware and firmware (software).	Remember	CO 1
4	Write the advantages of embedded systems?	Advantages of embedded system are: • Small size and faster to load • More specific to one task • Easy to manage • Low cost • Spend less resources	Remember	CO 1
5	Write the sequence of design process of an embedded system.	The sequence of design process of an embedded system are, • Requirements, • Specification, • Architecture, • Designing hardware and software • Components and • Integration	Remember	CO 1

S.No	QUESTION	ANSWER	Blooms Level	CO
6	Define non-recurring engineering (NRE) cost.	NRE cost is the one-time monetary cost of designing the system. Once the system is designed, any number of units can be manufactured without incurring any additional design cost; hence the name non-recurring.	Remember	CO 1
7	Give the applications of an embedded system?	The major applications of embedded systems are camcorders, cameras, washing machine, refrigerator, anti-lock breaking system (ABS), engine control, Air conditioners, sprinklers, fire alarms, cellular phones, network routers and switches, automatic teller machines, point of sales and smart card readers.	Remember	CO 1
8	Explain the criteria used to classify the embedded systems?	The classification of embedded system is based on following criteria's: • On generation • On complexity & performance • On deterministic behaviour • On triggering	Remember	CO 1
9	Give two essential units of a processor on an embedded system?	Processors inside a system have two essential units: **Control unit:** This unit in processors performed the program flow control operation inside an embedded system. The control unit also acts as a fetching unit for fetching the set of instructions stored inside a memory. **Execution unit:** This unit is used for execution the various tasks inside a processors. It mainly comprises of arithmetic and logical unit (ALU).	Remember	CO 1
10	Analyze the execution unit of a processor in an embedded system do?	Execution unit is used for execution the various tasks inside a processors. It mainly comprises of arithmetic and logical unit (ALU) and it also include a circuit that executes the instruction sets used to perform program control operation inside processors.	Remember	CO 1
11	Differentiate between Microcontroller and Microprocessor.	Microprocessor is typically designed to be general purpose processor which requires separate external memory and I/O interfaces. Example: ARM Processor Microcontrollers can be considered as self-contained, cost effective systems with a processor, on chip memory and Input/output peripherals built into a single package. Example: 8051 Microcontroller	Remember	CO 1

S.No	QUESTION	ANSWER	Blooms Level	CO
12	Define small scale embedded systems?	Small-scale embedded systems are an entry-level system in which 8-bit or 16-bit processor is used. The processor has very limited resources like RAM, ROM and processing speed. For the development of the small-scale embedded system, we need integrated development environment (IDE) for writing the code.	Remember	CO 1
13	Define medium scale embedded systems?	Medium Scale Embedded Systems: These systems are usually designed with a single or few 16-bit or 32-bit microcontrollers or Digital Signal Processor (DSPs) or Reduced Instruction Set Computers (RISCs) being used. These system have both hardware and software complexities.	Remember	CO 1
14	Define sophisticated embedded systems?	These types of embedded systems have enormous hardware and software complexities that may need ASIPs, IPs, PLAs, scalable or configurable processors. They are used for cutting-edge applications that need hardware and software Co-design and components which have to assemble in the final system.	Remember	CO 1
15	Give some examples for scale scale embedded systems	Some examples for medium scale embedded systems • Stepper motor controllers for a robotic system • Washing or cooking system • Multitasking toys • ACVM	Remember	CO 1
16	Give some examples for medium scale embedded systems	Some examples for medium scale embedded systems • Router, a hub and a gateway • Entertainment systems • Banking systems • Signal tracking systems	Remember	CO 1
17	Give some examples for sophisticated embedded systems	Some examples for sophisticated embedded systems • Embedded system for wireless LAN • Embedded systems for real time video • Security products • ES for space lifeboat.	Remember	CO 1
18	What are the requirements of embedded system?	Before designing a system, it must to understand what has to be designed. This can be known from the starting steps of a design process. • Reliability • Low power consumption • Cost effectiveness • Efficient use of processing power	Remember	CO 2
19	What are the challenges of embedded systems?	• Hardware needed • Meeting the deadlines • Minimizing the power consumption • Design for upgradeability	Remember	CO 1

S.No	QUESTION	ANSWER	Blooms Level	CO
20	Give the steps in embedded system design process?	Required steps for embedded system design is • Requirements • Specifications • Architecture • Components • System integration	Remember	CO 2
21	Define is the operational quality attribute?	These are attributes related to operation or functioning of an embedded system. The way an embedded system operates affects its overall quality. The operational quality attribute are, Response, Throughput, Reliability Maintainability, Security Safety.	Remember	CO 2
22	Define is the non-operational quality attribute?	These are attributes not related to operation or functioning of an embedded system. The way an embedded system operates affects its overall quality. the non-operational quality attributes are, Testability and Debug-ability, Evolvability, Portability, Time to prototype and market Per unit and total cost.	Remember	CO 2
23	What is a microprocessor?	Microprocessor is an integrated circuit that contains all the functions of a central processing unit (CPU) of a computer. In the world of personal computers, the terms microprocessor and CPU are used interchangeably	Remember	CO 1
24	What are the functions of memory?	The memory functions are • To provide storage for the software that it will run. • To store program variables and the intermediate results • Used for storage of information	Remember	CO 1
25	Define real time system?	A **Real time system** is defined as a data processing system in which the time interval required to process and response to input is so small that it controls the environment.	Remember	CO 1
26	What is the function of Time triggered in embedded system?	Activities within the system follow a statically computed schedule (i.e., they are allocated time slots during which they can take place) and thus by nature are predictable.	Remember	CO 1
27	What are functional and non-functional requirements?	Functional description gives the basic functions of the embedded system being designed. Non-functional requirements do not affect the basic functionality of the system Non-functional requirements are the other requirements such as performance, cost, physical size and weight, power consumption etc.	Remember	CO 2

S .No	QUESTION	ANSWER	Blooms Level	CO
28	Why system integration phase is difficult?	System integration is difficult because it usually uncovers problems. It is often hard to observe the system in sufficient detail to determine exactly what is wrong because the debugging facilities for embedded systems are usually much more limited than what you would find on desktop systems.	Remember	CO 1
29	Name some of the hardware parts of embedded systems?	The hardware parts of embedded systems are, • Power source • Clock oscillator circuit • Timers • Memory units • DAC and ADC • LCD and LED displays • Keyboard/Keypad	Remember	CO 1
30	What is a RISC processor?	RISC stands for Reduced Instruction Set Computer. It is designed to reduce the execution time by simplifying the instruction set of the computer	Remember	CO 1
31	What is a CISC processor?	CISC stands for Complex Instruction Set Computer. It is designed to minimize the number of instructions per program, ignoring the number of cycles per instruction	Remember	CO 1
32	What is mean by Harvard architecture.	Harvard architecture is a type of computer architecture that separates its memory into two parts so data and instructions are stored separately. The architecture also has separate buses for data transfers and instruction fetches. This allows the CPU to fetch data and instructions at the same time.	Remember	CO 1
33	What is mean by Von-Neumann architecture?	Von Neumann Architecture also Known as the *Von Neumann model*, the computer consisted of a CPU, memory and I/O devices. The program is stored in the memory. The CPU fetches an instruction from the memory at a time and executes it. Data and instructions stored in a single memory unit.	Remember	CO 1
34	Define Unified Modeling Language (UML)	UML was designed to be useful at many levels of abstraction in the design process. UML is useful because it encourages design by successive refinement and progressively adding detail to the design, rather than rethinking the design at each new level of abstraction. UML is an object-oriented modeling language.	Remember	CO 2
35	Define soft real-time system?	Soft real time system is a system whose operation is degrades if results are not produce according to the specified timing requirement.	Remember	CO 1

S.No	QUESTION	ANSWER	Blooms Level	CO
36	Define hard real-time system?	A hard real-time system (also known as an immediate real-time system) is hardware or software that must operate within the confines of a stringent deadline. The application may be considered to have failed if it does not complete its function within the allotted time span.	Remember	CO 1
37	What are the major trends in processor architecture in embedded development?	System on Chip (SoC) SoC are now available for a wide variety of diverse applications like Set Top boxes, Media Players, PDA, etc. SoC integrate multiple functional components on the same chip thereby saving board space which helps to miniaturize the overall design.	Remember	CO 1
38	Why do use microprocessors?	Microprocessors are a very efficient way to implement digital systems. Microprocessors make it easier to design families of products that can be built to provide various feature sets at different price points and can be extended to provide new features to keep up with rapidly changing markets.	Remember	CO 1
39	Define User Interface?	User interface: Microprocessors are frequently used to control complex user interfaces that may include multiple menus and many options. The moving maps in Global Positioning System (GPS) navigation are good examples of sophisticated user interfaces.	Remember	CO 1
40	What are the various types of memory in embedded systems?	· RAM (internal External) · ROM/PROM/EEPROM/Flash · Cache memory	Remember	CO 1
MODULE-II				
1	What is an Embedded C?	Embedded C is an extension of C Programming language. C programming language is used to develop desktop based applications. While, Embedded C is used to develop micro-controller based applications such as device drivers (memory device driver, camera d e v i c e driver, WIFI device drive etc.)	Remember	CO 3
2	What are some common causes for the segmentation fault error in C?	There are some of the cases (causes), when segmentation fault error may occur, • Usages of the dereferenced pointer (i.e. a pointer which may not have a valid address/memory location to point). • If you are trying to access a memory area which is read- only. In that case, the program may return segmentation fault error. • Segmentation fault is the reason to generate stack overflow error in C.	Remember	CO 3

S.No	QUESTION	ANSWER	Blooms Level	CO
3	What is the need for an infinite loop in embedded systems?	Embedded systems require infinite loops for repeatedly processing or monitoring the state of the program. For instance, the case of a program state continuously being verified for any exceptional errors that might just happen during run-time such as memory outage or divide by zero, etc.	Remember	CO 3
4	Define compiler and cross-compiler.	Compiler is a software that transforms a computer program written in high-level programming language into machine language and the cross compiler is a type of a compiler that can create an executable code for a platform other than the one on which the compiler is running.	Remember	CO 3
5	Explain what is interrupt latency? How can you reduce it?	Interrupt latency is a time taken to return from the interrupt service routine post handling a specific interrupt. By writing minor ISR routines, interrupt latency can be reduced.	Remember	CO 3
6	Mention how I/O devices are classified for embedded system?	The I/O devices of embedded system are classified in to two categories series and parallel.	Remember	CO 5
7	What is stack overflow error in C?	This error may occur if the program tries to access the memory beyond its available maximum limit. We can also say that if a pointer exceeds the stack limitations (boundaries)When this error occurs program terminates and does not execute further instructions. Therefore, we must be careful while using the pointer and limit boundaries.	Remember	CO 3
8	Define spilled or swapped out variables.	When there are more local variables than available registers, the compiler stores the excess variables on the processor stack. These variables are called spilled or swapped out variables	Remember	CO 3
9	How to use a variable in a source file which is defined in another source file?	Extern keyboard can be to declare a variable which allows accessing the variable in another file.	Remember	CO 3
10	How will you protect a character pointer by some accidentally modification with the pointer address?	Constant character pointer (const char*) prevents the unnecessary modifications with the pointer address in the string.	Remember	CO 3
11	How do you write code for an infinite loop?	An infinite loop is the main component of an embedded application, which is used to run an application all time, an infinite loop can be coded by using while(1) and for(;;)	Remember	CO 3
12	Write a declaration for an array of 10 pointers to an integer'.	An array of 10 pointers to an integer is declared as, int *ptr(10);	Remember	CO 3
13	What are the main components of an embedded system?	Three main components of embedded systems: The Hardware Application Software and RTOS.	Remember	CO 10

S.No	QUESTION	ANSWER	Blooms Level	CO
14	Why do we use static variable in C?	The purposes to use a static variable are: A static variable does not redeclare that means if it is declared in a function it will not redeclare on each function call, therefore, static is able to maintain the value.	Remember	CO 3
15	What is the need for LCD and LED display?	It used for displaying and messaging. The system must provide necessary circuit and software for the output to LCD controller.	Remember	CO 10
16	Define device driver.	A device driver is software for controlling, reading, sending a byte of stream of bytes from/to the device.	Remember	CO 3
17	What are the classifications of I/O devices?	Synchronous serial input and output Asynchronous serial UART input and output Parallel one bit input and output Parallel port input and output	Remember	CO 5
18	Define Switch bounce.	When a switch is toggled, contacts have to physically move from one position to another. As the components of the switch settle into their new position, they mechanically bounce, causing the underlying circuit to be opened and closed several times.	Remember	CO 5
19	What do you mean by asynchronous communication?	The most basic way of sharing data is by copying the data in question to each server. This will only work if the data is changed infrequently and always by someone with administrative access to all the servers in the cluster.	Remember	CO 10
20	What are the characteristics of asynchronous communication?	Variable bit rate - need not maintain constant phase difference Handshaking method is used Transmitter need not transmit clock information along with data bit stream	Remember	CO 10
21	What are the three ways of communication for a device?	Separate clock pulse along with data bits Data bits modulated with clock information Embedded clock information with data bits before transmitting.	Remember	CO 10
22	Define Interfacing?	Interfacing is the method of connecting or linking together one device, especially a computer or micro-controller with another allowing us to design or adapt the output and input configurations of the two electronic devices so that they can work together.	Remember	CO 3
23	Define pseudo-code.	Pseudo-code is a useful tool when developing an idea before writing a line of true code or when explaining how a particular procedure or function or even an entire program	Remember	CO 3

S.No	QUESTION	ANSWER	Blooms Level	CO
24	What is design technology?	Design technology involves the manner in which we convert our concept of desired system functionality into an implementation. Design methodologies are used in taking the decisions at the time of designing the large systems with multiple design team members.	Remember	CO 10
25	What is prototype?	Prototype is the model of the system being designed. Prototypes are a very useful tool when dealing with end users—rather than simply describe the system to them in road, technical terms, a prototype can let them see, hear, and touch at least some of the important aspects of the system.	Remember	CO 10
26	Expand and define ADC & DAC converters.	ADC stands for Analog to Digital Converter, which converts the analog signal into the digital signal. DAC stands for Digital to Analog Converter and it converts the Digital signal into an analog signal.	Remember	CO 10
27	Define endianness.	Endianness is a term that describes the order in which a sequence of bytes are stored in computer memory. In computing, endianness is the ordering or sequencing of bytes of a word of digital data in computer memory storage or during transmission.	Remember	CO 10
28	Define big-endian	Endianness is a term that describes the order in which a sequence of bytes are stored in computer memory. A big-endian system stores the most significant byte of a word at the smallest memory address and the least significant byte at the largest memory address.	Remember	CO 10
29	what is size of character, integer, integer pointer, character pointer?	The size of character is 1 byte. Size of integer is 4 bytes. Size of integer pointer and character is 8 bytes on 64 bit machine and 4 bytes on 32 bit machine.	Remember	CO 3
30	What are inline functions?	The ARM compilers support inline functions with the keyword inline. These functions have a small definition and the function body is substituted in each call to the inline function. The argument passing and stack maintenance is skipped and it results in faster code execution, but it increases code size, particularly if the inline function is large or one inline function is used often.	Remember	CO 3

S.No	QUESTION	ANSWER	Blooms Level	CO
31	Define Simplex Mode transmission.	In Simplex mode, the communication is unidirectional, as on a one-way street. Only one of the two devices on a link can transmit, the other can only receive. The simplex mode can use the entire capacity of the channel to send data in one direction. Example: Keyboard and traditional monitors. The keyboard can only introduce input, the monitor can only give the output.	Remember	CO 10
32	Define Half-Duplex Mode transmission.	In half-duplex mode, each station can both transmit and receive, but not at the same time. When one device is sending, the other can only receive, and vice versa. The half-duplex mode is used in cases where there is no need for communication in both direction at the same time. The entire capacity of the channel can be utilized for each direction. Example: Walkie- talkie in which message is sent one at a time and messages are sent in both the directions.	Remember	CO 10
33	Advantages and disadvantages of using macro and inline functions?	The advantage of the macro and inline function is that the overhead for argument passing and stuff is reduced as the function are in-lined. The advantage of macro function is that we can write type insensitive functions. It is also the disadvantage of macro function as macro functions can't do validation check. The macro and inline function also increases the size of the executable.	Remember	CO 3
34	What is job of preprocessor and compiler	The preprocessor commands are processed and expanded by the preprocessor before actual compilation. After preprocessing, the compiler takes the output of the preprocessor and the source code, and generates assembly code	Remember	CO 3
35	What happens when recursive functions are declared inline?	In lining an recursive function reduces the Overhead of saving context on stack. But, in line is merely a suggestion to the compiler and it does not guarantee that a function will be in lined. Obviously, the compiler won't be able to inline a recursive function infinitely. It may not inline it at all or it may inline it, just a few levels deep.	Remember	CO 3
36	What is a function pointer?	A function pointer is similar to the other pointers but the only difference is that it points to a function instead of the variable. In the other word, we can say, a function pointer is a type of pointer that store the address of a function and these pointed function can be invoked by function pointer in a program whenever required.	Remember	CO 3

S.No	QUESTION	ANSWER	Blooms Level	CO
37	Where can the function pointers be used?	There are a lot of places, where the function pointers can be used. Generally, function pointers are used in the implementation of the callback function, finite state machine and to provide the feature of polymorphism in C language etc.	Remember	CO 3
38	Define Full-Duplex Mode transmission.	In full-duplex mode, both stations can transmit and receive simultaneously. In full duplex mode, signals going in one direction share the capacity of the link with signals going in other direction, this sharing can occur in two ways.	Remember	CO 3
39	What is dangling pointer?	If a pointer is de-allocated and freed and the pointer is not assigned to NULL, then it may still contain that address and accessing the pointer means that we are trying to access that location and it will give an error. This type of pointer is called dangling pointer.	Remember	CO 3
40	Define Asynchronous communication.	Asynchronous communication is the transmission of data, generally without the use of an external clock signal, where data can be transmitted intermittently rather than in a steady stream. Asynchronous communication is when two (or more) people can communicate without the requirement that they be "present" at the same exact moment in time.	Remember	CO 3
MODULE-III				
1	Define process.	Process is a computational unit that processes on a CPU under the control of a scheduling kernel of an OS. A process defines a sequentially executing program and its state.	Remember	CO 7
2	What is meant by Process Control Block?	It is a data structure which contains all The information and components regarding with the process.	Remember	CO 7
3	Define task.	A task is a set of computations or actions that processes on a CPU under the control of a scheduling kernel. It also has a process control structure called a task control block that saves at the memory.	Remember	CO 7
4	Define Task state.	It has states in the system as follows: idle, ready, running, blocked and finished.	Remember	CO 7
5	Define Task Control Block (TCB).	A memory block that holds information of program counter, memory map, the signal dispatch table, signal mask, task ID, CPU state and a kernel stack.	Remember	CO 7

S.No	QUESTION	ANSWER	Blooms Level	CO
6	What is a thread?	A process or task is characterized by a collection of resources that are utilized to execute a program. The smallest subset of these resources that is necessary for the execution of the program is called a thread.	Remember	CO 7
7	Define Inter process communication.	An output from one task passed to another task through the scheduler and use of signals, exception, semaphore, queues, mailbox, pipes, sockets, and RPC.	Remember	CO 7
8	What is shared data problem?	If a variable is used in two different processes and another task if interrupts before the operation on that data is completed then the value of the variable may differ from the one expected if the earlier operation had been completed .This ids known as shared data problem.	Remember	CO 8
9	Describe Semaphore.	Semaphore provides a mechanism to let a task wait till another finishes. It is a way of synchronizing concurrent processing operations. When a semaphore is taken by a task then that task has access to the necessary resources. When given the resources unlock. Semaphore can be used as an event flag or as a resource key.	Remember	CO 7
10	Define Mutex.	Mutex is a semaphore that gives at an instance two tasks mutually exclusive access to resources.	Remember	CO 7
11	Differentiate counting semaphore and binary semaphore.	**B**inary semaphore When the value of binary semaphore is one it is assumed that no task has taken it and that it has been released. When the value is 0 it is assumed that it has been taken. Counting semaphore Counting semaphore is a semaphore which can be taken and given number of times. Counting semaphores are unsigned integers.	Remember	CO 7
12	What is Priority inversion?	'**Priority inversion**' is the condition in which a high priority task needs to wait for a low priority task to release a resource which is shared between the high priority task and the low priority task.	Remember	CO 9
13	Define shared memory.	Shared memory is memory that may be simultaneously accessed by multiple programs with an intent to provide communication among them or avoid	Remember	CO 8
14	Define Message Queue.	A task sending the multiple FIFO or priority messages into a queue for use by another task using queue messages as an input.	Remember	CO 8
15	Define Mailbox.	A mailboxes are software-engineering components used for interprocess communication, or for inter-thread communication within the same process.	Remember	CO 8

S.No	QUESTION	ANSWER	Blooms Level	CO
16	Define deadlock.	A deadlock is a situation in which two computer programs sharing the same resource are effectively preventing each other from accessing the resource, resulting in both programs ceasing to function.	Remember	CO 8
17	Define Remote Procedure Call.	A remote procedure call is an interprocess communication technique that is used for client-server based applications. It is also known as a subroutine call or a function call.	Remember	CO 7
18	Define starvation.	In the multitasking context, starvation is the condition in which a process does not get the resources required to continue its execution for a long time.	Remember	CO 6
19	Define throughput.	Throughput in CPU scheduling is the number of processes that are completed per unit time.	Remember	CO 8
20	List the functions of a kernel.	Process management, Process creation to deletion, Processing, resource requests, Scheduling, Memory management, I/O management and Device management	Remember	CO 7
21	Define Racing or Race condition.	Racing or Race condition is the situation in which multiple processes compete (race) each other to access and manipulate shared data concurrently.	Remember	CO 6
22	What are the benefits of multithreaded programming?	The benefits of multithreaded programming can be broken down into four major categories: Responsiveness, Resource sharing, Economy, Utilization of multiprocessor architectures	Remember	CO 7
23	Define RTOS.	A real-time operating system (RTOS) is an operating system that has been developed for real-time applications. It is typically used for embedded applications, such as mobile telephones, industrial robots, or scientific research equipment	Remember	CO 6
24	Define CPU scheduling.	CPU scheduling is the process of switching the CPU among various processes. CPU scheduling is the basis of multi-programmed operating systems. By switching the CPU among processes, the operating system can make the computer more productive.	Remember	CO 9
25	Define Task/Process Synchronization.	The act of making processes aware of the access of shared resources by each process to avoid conflicts is known as `Task/Process Synchronization'.	Remember	CO 9

S.No	QUESTION	ANSWER	Blooms Level	CO
26	What is preemptive scheduling?	Preemptive scheduling can preempt a process which is utilizing the CPU in between its execution and give the CPU to another process.	Remember	CO 8
27	Classify the IPC techniques.	IPC techniques are divided into methods for message passing, synchronization, shared memory, and remote procedure calls (RPC). The method of IPC used may vary based on the bandwidth and latency of communication between the threads, and the type of data being communicated.	Remember	CO 8
8	What is non-preemptive scheduling?	Under non-preemptive scheduling once the CPU has been allocated to a process, the process keeps the CPU until it releases the CPU either by terminating or switching to the waiting state.	Remember	CO 8

29	Give syntax for wait semaphore.	The classic definition of ‗wait‘
		 wait (S)
		 {
		 while (S<=0);
		   S--;
		 }
			Remember	CO 8

30	Give syntax for signal semaphore.	The classic definition of ‗signal‘
		 signal(S)
		 {
		   S++;
		 }
			Remember	CO 8

31	Define kernel of operating system.	The kernel is the core of the operating system and is responsible for managing the system resources and the communication among the hardware and other system services.	Remember	CO 8
32	Define General Purpose Operating System.	Operating Systems, which are deployed in general computing systems, are referred as General Purpose Operating System (GPOS). A General Purpose Operating System (GPOS) is an essential component of any mobile device, server, or computer system, and is responsible for running all the applications in an installation.	Remember	CO 8
33	Define multiprocessing?	"Multiprocessing" defines as the ability to execute multiple processes simultaneously. Systems which are capable of performing multiprocessing are known as multiprocessor systems.	Remember	CO 8
34	Define Multiprogramming?	The ability of the operating system to have multiple programs in memory, which are ready for execution, is referred as "Multiprogramming".	Remember	CO 8
35	Define Multitasking?	"Multitasking" refers to the ability of an operating system to hold multiple processes in memory and switch the processor (CPU) from executing one process to another process.	Remember	CO 8

S.No	QUESTION	ANSWER	Blooms Level	CO
36	Define Context switching.	The act of switching CPU among the processes or changing the current execution context is known as 'Context switching'.	Remember	CO 9
37	Define Context saving	The act of saving the current context which contains the context details (Register details, memory details, system resource usage details, execution details, etc.) for the currently running process at the time of CPU switching is known as 'Context saving'.	Remember	CO 9
38	Define Context retrieval.	The process of retrieving the saved context details for a process, which is going to be executed due to CPU switching, is known as 'Context retrieval'.	Remember	CO 9
39	Define task/process scheduling".	Determining which task/process is to be executed at a given point of time is known as "task/process scheduling".	Remember	CO 9
40	Define Turnaround Time.	Turnaround Time: It is the amount of time taken by a process for completing its execution. It includes the time spent by the process for waiting for the main memory, time spent in the ready queue, time spent on completing the I/O operations, and the time spent in execution.	Remember	CO 9
MODULE-IV				
1	Define debugging.	Debugging is the process of finding and resolving defects or problems within a computer program that prevent correct operation of computer software or a system.	Remember	CO 10
2	Define host.	Host system is any networked computer that provides services to other systems or users. Host System's usually run a multi- user operating system such as Unix, MVS or VMS, or at least an operating system with network services such as Windows	Remember	CO 10
3	Define target machine.	An executable image built for a target embedded system can be transferred from the host development system onto the target, which is called loading the image, by Programming the entire image into the EEPROM or flash memory.	Remember	CO 10
4	Define linkers.	The linker combines object modules into a single, executable program . The linker processes object modules created by the Compiler and Assembler and automatically includes the appropriate run-time library modules. You may invoke the linker from the command line or automatically from within the µVision IDE	Remember	CO 10
5	Define interpreter.	An interpreter does expression by expression (line by line) translation to the machine executable codes.	Remember	CO 10

S.No	QUESTION	ANSWER	Blooms Level	CO
6	Define locators.	The locator combines object modules into a single, executable program. It resolves external and public references and assigns absolute addresses to relocatable programs segments. The linker processes object modules created by the Compiler and Assembler and automatically includes the appropriate run-time library modules.	Remember	CO 10
7	Define compiler.	The job of compiler is mainly to translate programs written in some human-readable language into an equivalent set of opcodes for a particular processor.	Remember	CO 10
8	Define dissembler	A dissembler translates the object codes into the mnemonics form of assembly language. It helps in understanding the previously made object code.	Remember	CO 10
9	Define cross compiler.	A cross compiler is a compiler capable of creating executable code for a platform other than the one on which the compiler is running. For example, a compiler that runs on a Windows 7 PC but generates code that runs on Android Smartphone is a cross compiler.	Remember	CO 10
10	Define assembler.	An assembler is a program that translates the assembly mnemonics into the binary opcode and instruction that is into an executable file called object file. It also creates a link file that can be printed.	Remember	CO 10
11	Define cross assembler.	A cross assembler is a program which generates machine code for a processor other than the one it is currently run on.	Remember	CO 10
12	Write the hardware used in Host system in a PC.	High performance processor with caches, Large RAM memory, read only memory input-output system, disk, keyboard, display monitor, Mice, Network connection.	Remember	CO 10
13	Expand IDE.	Integrated Development Environment.	Remember	CO 10
14	Define software tools.	The tools which required for the application of software high level language programming are software tools example development kit, compiler, linkers etc.	Remember	CO 10
15	What is the application of development kit in software tools.	Development kit is used for editing, configuring, GUIs development and compiling.	Remember	CO 10
16	Define simulator.	A simulator is a program which runs on the development system (i.e. your PC) and imitates the architecture of the target processor.	Remember	CO 10
17	Write laboratory tools.	The examples of laboratory tools are simple volt-ohm meter, LED tests and logic probes, oscilloscope etc.	Remember	CO 10

S.No	QUESTION	ANSWER	Blooms Level	CO
18	Define Oscilloscope.	An oscilloscope is a laboratory instrument commonly used to display and analyze the waveform of electronic signals. In effect, the device draws a graph of the instantaneous signal voltage as a function of time.	Remember	CO 10
19	Define Bit Rate Meter.	Bit rate refers to the rate at which data is processed or transferred. It is usually measured in seconds, ranging from bps for smaller values to kbps and mbps.	Remember	CO 10
20	Expand and define I.C.E.	I.C.E stands for In-circuit Emulator and An in-circuit emulator (ICE) is a hardware interface that allows a programmer to change or debug the software in an embedded system.	Remember	CO 10
21	Define logic analyzer.	A logic analyzer is electronic instrument that captures and displays multiple signals from a digital system or digital circuit. A logic analyzer may convert the captured data into timing diagrams, protocol decodes, state machine traces, assembly language, or may correlate assembly with source-level software.	Remember	CO 10
22	What is socket?	A socket is one endpoint of a two-way communication link between two programs running on the network.	Remember	CO 10
23	Define Prototype.	A prototype is an early sample, model, or release of a product built to test a concept or process or to act as a thing to be replicated or learned from. It is a term used in a variety of contexts, including semantics, design, electronics, and software programming.	Remember	CO 10
24	Define device Programmer.	A device programmer, also called "chip programmer", "circuit programmer", "IC programmer" or just "EPROM burner", is a piece of hardware for transferring data into programmable integrated circuits, such as ROMs, EPROMs, EEPROMs, Flash Memory, GALs, PALs, PLDs, CPLDs, FPGAs, and microcontrollers.	Remember	CO 10
25	Define Big endian.	An ordering in which the highest byte of a number is taken first.	Remember	CO 10
26	Define Little endian.	An ordering in which the lowest byte of a number is taken as first.	Remember	CO 10
27	Define latency	Time taken to activate code execution after an event or time taken in finishing certain code before next code starts.	Remember	CO 10

S.No	QUESTION	ANSWER	Blooms Level	CO
28	Define networking stack.	A set of network protocol layers that work together. The OSI Reference Model that defines seven protocol layers is often called a stack, as is the set of TCP/IP protocols that define communication over the internet. The term stack also refers to the actual software that processes the protocols	Remember	CO 10
29	Define Platform dependency.	A function or ISR or device driver or OS function or data type or data structure utilization, dependent on the processor or memory or devices in system.	Remember	CO 10
30	Define edit-test-debug cycle.	A cycle in implementing Phase in which codes are edited, tested and debugged for reported error on test.	Remember	CO 10
31	Define hardware software tradeoff.	A hardware/software trade-off is the establishment of the division of responsibility for performing system functions between the software, firmware and hardware.	Remember	CO 10
32	Define throughput.	Number of processes/specified functions executed per unit time. For I/O system, it is the number of bytes outputted or read per unit time.	Remember	CO 10
33	Define performance accelerators.	An accelerator is a hardware device or a software program with a main function of enhancing the overall performance of the computer. There are various types of accelerators available to help with enhancing the performance of different aspects of a computer's function.	Remember	CO 10
34	Define porting issues.	Issues when a software developed at one platform is embedded at another platform.	Remember	CO 10
35	Define burning in embedded system.	"Burn" is just a word, the program, which just happens to be a collection of bytes, is written to the Program Memory (ROM/Flash) and Data memory (RAM) and probably EEPROM (Non Volatile Memory - NVM).The format in which those bytes are stored in the hex file or whatever output the compiler produces is different based on the manufacturer.	Remember	CO 10
36	Define volt-ohm meter.	A multimeter or a multitester, also known as a VOM (volt-ohm- milli ammeter), is an electronic measuring instrument that combines several measurement functions in one unit. A typical multimeter can measure voltage, current, and resistance.	Remember	CO 10

37	Define In circuit Emulator.	In-circuit emulation (ICE) is the use of a hardware device in-circuit emulator used to debug the software of an embedded system. It operates by using a processor with the additional ability to support debugging operations, as well as to carry out the main function of the system.	Remember	CO 10
38	Define Logic Analyzer.	A logic analyzer is an electronic instrument that captures and displays multiple signals from a digital system or digital circuit. A logic analyzer may convert the captured data into timing diagrams, protocol decodes, state machine traces, assembly language, or may correlate assembly with source-level software.	Remember	CO 10
39	Define connectors.	A connector is a device that joins two pieces of equipment ,wire, piping together.	Remember	CO 10
40	Define circular linked list.	Circular linked list is a linked list where all nodes are connected to form a circle. There is no NULL at the end. A circular linked list can be a singly circular linked list or doubly circular linked list.	Remember	CO 10
MODULE-V				
1	What is I2C?	I2C is a serial bus for interconnecting ICs. It has a start bit and a stop bit like an UART. It has seven fields for start,7 bit address, defining a read or a write, defining byte as acknowledging byte, data byte, NACK and end.	Remember	CO 12
2	What are the bits in I2C corresponding to?	It has seven fields for start,7 bit address, defining a read or a write, defining byte as acknowledging byte, data byte, NACK and end	Remember	CO 12
3	What is a CAN bus?	CAN is a serial bus for interconnecting a central Control network. It is mostly used in automobiles. It has fields for bus arbitration bits, control bits for address and data length data bits, CRC check bits, acknowledgement bits and ending bits.	Remember	CO 12
4	State the special features of I2C.	• Low cost • Easy implementation • Moderate speed upto 100 kbps	Remember	CO 12
5	What are the disadvantages of I2C?	• Slave hardware does not provide much support • Open collector drivers at the master leads to be confused	Remember	CO 12
6	Define ARM.	In the early 'pre-ARM' days, ARM stood for Acorn RISC Machines. Then when ARM became a separate company ARM became Advanced RISC Machines and the modern name is just ARM. RISC stands for Reduced Instruction Set Computer which is the type of microprocessor design.	Remember	CO 11

S.No	QUESTION	ANSWER	Blooms Level	CO
7	Define SHARC.	The Super Harvard Architecture Single-Chip Computer (SHARC) is a high performance floating-point and fixed- point DSP from Analog Devices. SHARC is used in a variety of signal processing applications ranging from single-CPU guided artillery shells to 1000-CPU over-the-horizon radar processing computers.	Remember	CO 11
8	Define networked embedded system.	Embedded systems connected internally on same IC or systems at very short, short and long distances can be networked using a type of the i/o buses- CAN, I 2C, USB, PCI.	Remember	CO 11
9	Define Serial bus protocol.	In telecommunication and data transmission, serial communication is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus examples of serial bus protocol are CAN, I2C, USB.	Remember	CO 12
10	What is Parallel bus Protocol.	Parallel transmission protocols are now mainly reserved for applications like a CPU bus or between IC devices that are physically very close to each other, usually measured in just afew centimeters.	Remember	CO 12
11	Define elevator controller.	An Elevator controller is a system to control the elevators, either manual or automatic. The controller usually tune down the voltage between 12V to 24V to the controlling system, only the motor needs 3-phase power supply.	Remember	CO 12
12	What is the use of elevator controller?	These electromechanical systems used relay logic controllers of increasing complexity to control the speed, position and door operation of an elevator or bank of elevators. It helped reduce the waiting time on any given floor by coordinating the movement of the building's elevators.	Remember	CO 12
13	Define memory organization.	Memory organization defines how memory space is organized for a microprocessor/microcontroller.	Remember	CO 12
14	What is the latest ARM processor?	ARM Cortex-A72,ARM is announcing its next generation ARM Cortex- A72 processor based on the 64-bit ARM v8-A design. ARM claims that the new chip delivers as much as 50 times the performance gain compared to processors from just five years ago, or 3.5 times the performance gain of the ARM Cortex-A15 processor.	Remember	CO 11

S.No	QUESTION	ANSWER	Blooms Level	CO
15	What is meant by ARM architecture?	An ARM processor is one of a family of CPUs based on the RISC (reduced instruction set computer) architecture developed by Advanced RISC Machines (ARM). ARM makes 32-bit and 64-bit RISC multi-core processors.	Remember	CO 11
16	Discuss about I2C?	I2C Protocol. Transmitting and receiving the information between two or more than two devices require a communication path called as a bus system. A I2C bus is a bidirectional two- wired serial bus which is used to transport the data between integrated circuits. The I2C stands for —Inter Integrated Circuit‖	Remember	CO 12
17	What is ARM instruction set?	An Instruction Set Architecture (ISA) is part of the abstract model of a computer. It defines how software controls the CPU. The Arm ISA family allows developers to write software and firmware that conforms to the Arm specifications, secure in the knowledge that any Arm-based processor will execute it in the same way.	Remember	CO 12
18	Write uses of CAN bus .	A Controller Area Network (CAN bus) is a robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in applications without a host computer.	Remember	CO 12
19	Draw the data frame format of CAN?		Remember	CO 12
20	Discuss the address space in ARM processor?	The address space of ARM processor is 2^{32} and it supports both Little & Big Endian.	Remember	CO 11
21	Demonstrate the important embedded processor chips?	An embedded processor is a micro Processor designed especially for handling the need of an embedded system. An ordinary microprocessor only comes with the processor in the chip. The peripherals are separate from the main chip, resulting in more power consumption.	Remember	CO 11
22	What are the two essential units of a processor on an embedded system?	1. Program flow control unit (CU) 2. Execution unit (EU)	Remember	CO 11

S.No	QUESTION	ANSWER	Blooms Level	CO
23	State the special features on I2C?	Most significant features include: • Only two bus lines are required. • No strict baud rate requirements like for instance with RS232, the master generates a bus clock. • Simple master/slave relationships exist between all components. • I2C is a true multi-master bus providing arbitration and collision detection.	Remember	CO 12
24	Give the size of ARM flash memory	512 Kbytes embedded Flash 96 Kbytes embedded SRAM.	Remember	CO 11
25	Give some examples for serial input I/O devices.	Audio input, video input, dial tone, transceiver input, scanner, serial IO bus input, etc.	Remember	CO 11
26	Describe networking for embedded system.	The embedded system was originally designed to work on a single device. The most efficient types of network used in the embedded system are BUS network and Ethernet network. A BUS is used to connect different network devices and to transfer a huge range of data, for example, serial bus, I2C bus, CAN bus, etc	Remember	CO 12
27	Define bus in microprocessor/ microcontroller.	Buses: The exchange of information. Information is transferred between units of the microcomputer by collections of conductors called buses. There will be one conductor for each bit of information to be passed, e.g., 16 lines for a 16 bit address bus. There will be address, control, and data buses.	Remember	CO 12
28	What are the three ways of communication for a device?	i. Separate clock pulse along with data bits ii. Data bits modulated with clock information iii. Embedded clock information with data bits before transmitting.	Remember	CO 11
29	Write about I2C Interface.	I2C uses only two wires: SCL (serial clock) and SDA (serial data). Both need to be pulled up with a resistor to +Vdd. There are also I2C level shifters which can be used to connect to two I2C buses with different voltages.	Remember	CO 12
30	What is processor?	A processor is an integrated electronic circuit that performs the calculations that run a computer. A processor performs arithmetical, logical, input/output (I/O) and other basic instructions that are passed from an operating system (OS). Most other processes are dependent on the operations of a processor.	Remember	CO 12

S.No	QUESTION	ANSWER	Blooms Level	CO
31	What is CAN Protocol?	CAN protocol can be defined as the set of rules for transmitting and receiving messages in a network of electronic devices. It means that it defines how data is transferred from one device to another in a network. It was designed specifically looking into the needs of the automobile industry.	Remember	CO 12
32	Write applications of CAN architecture.	CAN's robust architecture and advantages has forced many industries like Railway, Aircrafts, medical etc to adopt CAN protocol in their systems.	Remember	CO 12
33	Write about application layer.	It serves as a window for users and application processes to access network services. The common functions of the layers are resource sharing, remote file access, network management, electronic messages and so on.	Remember	CO 12
34	Write about Presentation layer.	The most important function of this layer is defining data formats such as ASCII text, EBCDIC text BINARY, BCD and JPEG. It acts as a translator for data into a format used by the application layer at the receiving end of the station.	Remember	CO 12
35	Write about Network layer.	It provides end to end logical addressing system so that a packet of data can be routed across several layers and establishes, connects and terminates network connections.	Remember	CO 12
36	Write about Session layer.	It allows to establishing, communicating and terminating sessions between processes running on two different devices performing security, name recognition and logging.	Remember	CO 12
37	Write about Transport layer.	The transport layer ensures that messages are delivered error-free, in sequence, and without loss or duplication. It relieves the higher layer from any concern with the transfer of data between them and their peers.	Remember	CO 12
38	Write about Data link layer.	It packages raw data into frames transferred from physical layer. This layer is responsible for transferring frames from one device to another without errors. After sending the frame it waits for the acknowledgement from receiving device.	Remember	CO 12
39	Write about Physical layer.	The physical layer transmits bit from one device to another and regulates the transmission of bit streams. It defines the specific voltage and the type of cable to be used for transmission protocols. It provides the hardware means of sending and receiving data on a carrier defining cables, cards and physical aspects.	Remember	CO 12

40	What is message framing in CAN?	Messages in CAN are sent in a format called frames. A frame is defined structure, carrying meaningful sequence of bit or bytes of data within the network. Framing of message is done by MAC sub layer of Data Link Layer. There are two type of frames standard or extended .These frames can be differentiated on the basis of identifier fields.	Remember	CO 12

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