INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**EMBEDDED SYSTEMS DESIGN AND PROGRAMMING**
Course Code	:	**AEC024**
Program	:	**B.Tech**
Semester	:	**VIII**
Branch	:	**ELECTRICAL AND ELECTRONICS ENGINEERING**
Section	:	**A**
Course Faculty	:	**Ms. M Suguna Sri**

OBJECTIVES:

I	To help students to consider in depth the terminology and nomenclature used in the syllabus.
II	To focus on the meaning of new words / terminology/nomenclature.

DEFINITIONS AND TERMINOLOGYQUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I EMBEDDED COMPUTING						
1	Define a System. With examples?	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. An example of a system is the laws and procedures of a democratic government. An example of a system is the way someone organizes their closet.	Remember	CO1	CLO 1	AEC024.1
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 embedded computers used	Remember	CO1	CLO 1	AEC024.1
3	Define embedded	An embedded system is a combination of computer	Remember	CO1	CLO 1	AEC024.1

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	systems?	hardware and software, fixed in capability or programmable, designed for a specific function or functions within a larger system. An embedded system is a combination of 3 things: • Hardware • Software Mechanical Components				
4	Write the advantages of embedded system?	Advantages of embedded system are: • Small size and faster to load • More specific to one task • Easy to manage • Low cost • Spend less resources These operating system is dedicated to one device so performance is good and use less resources like memory and micro-processors	Understand	CO1	CLO 2	AEC024.2
5	Write the sequence of design process of an embedded system.	The sequence of design process of an embedded system is, • Requirements, • Specification, • Architecture, • Designing hardware and software Components and integration	Understand	CO1	CLO 3	AEC024.3
6	Write the disadvantages of embedded system?	Disadvantages of embedded operating system are, • Difficult to upgrade • If any problem occurs then you need to reset settings • Nearly not scalable • Hardware is limited • Troubleshooting is difficult • Difficult to transfer data from one system to other	Understand	CO1	CLO 1	AEC024.1
7	Give the applications of an embedded system?	The application areas and the products in the embedded domain are countless. • Consumer • Household appliances: Washing machine,Refrigerator • Automotive industry:	Understand	CO1	CLO 3	AEC024.3

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		Anti-lock breaking system (ABS), engine control. • Home automation & security systems: Air conditioners, sprinklers, fire alarms. • Telecom: Cellular phones, telephone switches. • Computer peripherals: Printers, scanners. • Computer networking systems: Network routers and switches. • Healthcare: EEG, ECG machines. • Banking & Retail: Automatic teller machines, point of sales. • Card Readers: Barcode, smart card readers.				
8	Expalin the criteria based classifications of embedded systems?	The classification of embedded system is based on following criteria's: • On generation • On complexity & performance • On deterministic behaviour • On triggering	Understand	CO1	CLO 3	AEC024.3
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) and it also include a circuit that executes the	Understand	CO1	CLO 3	AEC024.3

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		instruction sets used to perform program control operation inside processors.				
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.	Understand	CO1	CLO 2	AEC024.2
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	CO1	CLO 1	AEC024.1
12	Discuss briefly about small scale embedded systems?	These types of embedded systems are designed with a single 8 or 16- bit microcontroller that may even be activated by a battery. For developing embedded software for small scale embedded systems, the main programming tools are an editor, assembler, cross assembler and integrated development environment (IDE).	Understand	CO1	CLO 2	AEC024.2
13	Discuss briefly about medium scale embedded systems?	These types of embedded systems design with a single or 16 or 32 bit microcontroller, RISCs or DSPs. These types of embedded systems have both hardware and software complexities. For developing embedded software for medium scale embedded systems, the main programming tools are C, C++, RTOS, debugger, source code engineering tool, simulator and IDE.	Understand	CO1	CLO 2	AEC024.2

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
14	Discuss briefly about 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.	Understand	CO1	CLO 2	AEC024.2
15	Give some examples for medium scale embedded systems	Some examples for mediumscale embedded systems • Stepper motor controllers for a robotic system • Washing or cooking system • Multitasking toys • ACVM	Understand	CO1	CLO 2	AEC024.2
16	Give some examples for medium scale embedded systems	Some examples for mediumscale embedded systems • Router, a hub and a gateway • Entertainment systems • Banking systems • Signal tracking systems	Understand	CO1	CLO 2	AEC024.2
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.	Understand	CO1	CLO 1	AEC024.1
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	Understand	CO1	CLO 3	AEC024.3
19	What are the challenges of embedded systems?	• Hardware needed • Meeting the deadlines • Minimizing the power consumption • Design for upgradeability	Remember	CO1	CLO 2	AEC024.2

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
20	Give the steps in embedded system design?	Required steps for embedded system design is • Requirements • Specifications • Architecture • Components • System integration	Remember	CO1	CLO 3	AEC024.3
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	CO1	CLO 4	AEC024.4
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	CO1	CLO 4	AEC024.4
23	What is a microprocessor?	A processor on a single integrated circuit. In the world of personal computers, the terms microprocessor and CPU are used interchangeably	Remember	CO1	CLO 1	AEC024.1
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	Understand	CO1	CLO 2	AEC024.2
25	What is the function of Event Triggered in embedded system?	Activities within the system (e.g., task run-times) are dynamic and depend upon occurrence of different events	Understand	CO1	CLO 2	AEC024.2
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	Understand	CO1	CLO 2	AEC024.2

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		predictable.				
27	What are functional and non-functional requirements?	Functional description gives the basic functions of the embedded system being designed. Non-functional requirements are the other requirements such as performance, cost, physical size and weight, power consumption etc.	Understand	CO1	CLO 4	AEC024.4
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.	Understand	CO1	CLO 4	AEC024.4
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	CO1	CLO 2	AEC024.2
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	CO1	CLO 2	AEC024.2
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	CO1	CLO 2	AEC024.2
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.	Understand	CO1	CLO 4	AEC024.4
33	What is mean by	**Von Neumann**	Understand	CO1	CLO 4	AEC024.4

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	Von Neumann Architecture ?	**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.				
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	CO1	CLO 4	AEC024.4
35	What is mean by Real time?	Many embedded computing systems have to perform in real timeô if the data is not ready by a certain deadline, the system breaks. In some cases, failure to meet a deadline is unsafe and can even endanger lives.	Understand	CO1	CLO 4	AEC024.4
36	What is mean by MultiMate?	Not only must operations be completed by deadlines, but many embedded computing systems have several real- time activities going on at the same time. They may simultaneously control some operations that run at slow rates and others that run at high rate	Understand	CO1	CLO 4	AEC024.4
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. Multicore Processors/ Chiplevel	Understand	CO1	CLO 4	AEC024.4

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		Multi Processor: these processors are known as: • Dual Core ó 2 cores • Tri Core ó 3 cores • Quad Core ó 4 cores **Reconfigurable Processors:** These processors contain an Array of Programming Elements (PE) along with a microprocessor. The PE can be used as a computational engine like ALU or a memory element.				
38	Why 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.	Understand	CO1	CLO 1	AEC024.1
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	CO1	CLO 4	AEC024.4
40	Define ASICs.	Application Specific Integrated Circuits. (ASIC) is a microchip design to perform a specific and unique application. As a single chip ASIC consumes a very small area in the total system. Thereby helps in the design of smaller system with high capabilities or functionalities.	Remember	CO1	CLO 4	AEC024.4
UNIT-II **PROGRAMMING EMBEDDED SYSTEMS IN C**						
1	What is an Embedded C?	Embedded C is an extension of C programming	Remember	CO 2	CLO 5	AEC024.5

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		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 device driver, WIFI device drive etc.)				
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 2	CLO 6	AEC024.6
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 2	CLO 5	AEC024.5
4	List out some of the commonly found errors in Embedded Systems?	Some of the commonly found errors in embedded systems are - Damage of memory devices static discharges and transient current - Address line malfunctioning due to a short in circuit - Data lines malfunctioning - Due to garbage or errors some memory locations being	Understand	CO 2	CLO 6	AEC024.6

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		inaccessible in storage • Inappropriate insertion of memory devices into the memory slots • Wrong control signals				
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.	Understand	CO 2	CLO 6	AEC024.6
6	Mention how I/O devices are Classified for embedded system?	The I/O devices of embedded system are classified in to two categories • Serial • Parallel	Understand	CO 2	CLO 6	AEC024.6
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 2	CLO 8	AEC024.8
8	Why do we use volatile÷ keyboard in C?	volatile is used to prevent the compiler to optimize any variable.When any variable is used frequently, the compiler optimizes it and keeps the variables in his memory (there are some specific memory blocks (registers), from there variable is accessibility is fast) to serve its value faster to the program.	Remember	CO 2	CLO 7	AEC024.7
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.	Understand	CO 2	CLO 7	AEC024.7
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.	Understand	CO 2	CLO 7	AEC024.7
11	How do you write	An infinite loop is the main	Remember	CO 2	CLO 6	AEC024.6

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	code for an infinite loop?	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(;;)				
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);	Understand	CO 2	CLO 7	AEC024.7
13	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.	Understand	CO 2	CLO 6	AEC024.6
14	What are the main components of an embedded system?	Three main components of embedded systems: The Hardware Applicatio n Software RTOS	Remember	CO 2	CLO 5	AEC024.5
15	What is the need for LC and LED display?	It used for displaying and messaging. The system must provide necessary circuit and software for the output to LCD controller.	Understand	CO 2	CLO 7	AEC024.7
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 2	CLO 8	AEC024.8
17	Whatare 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 2	CLO 5	AEC024.5
18	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 2	CLO 8	AEC024.8
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.	Understand	CO 2	CLO 8	AEC024.8
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	Understand	CO 2	CLO 8	AEC024.8

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		bit stream				
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	Understand	CO 2	CLO 8	AEC024.8
22	What is MBasic Compiler Software?	From version 5.3.0.0 onward, Basic Micro offers one version of its MBasic compiler, the Professional version. MBasic runs under Microsoft s Windows operating system in any version from Windows 95 to Windows XP. The computer requires an RS-232 port for connection to the ISP-PRO programmer board.	Remember	CO 2	CLO 7	AEC024.7
23	Definepseudo-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 2	CLO 7	AEC024.7
24	Whatisdesign 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 2	CLO 6	AEC024.6
25	What are the goals of design process?	A design process has several important goals beyond function, performance, and power. They are time to market, design cost and quality	Remember	CO 2	CLO 6	AEC024.6
26	Why is the verification of specification very important?	Verifying the requirements and specification is very important for the simple reason that bugs in the requirements or specification can be extremely expensive to fix later on. A bug introduced in the requirements or specification and left until maintenance could force an entire redesign of the product	Remember	CO 2	CLO 6	AEC024.6
27	What is prototype?	Prototype is the model of the system being designed. Prototypes are a very useful tool when dealing with end	Remember	CO 2	CLO 8	AEC024.8

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		usersô 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.				
28	What Is The Use Of Volatile Keyword?	The C's volatile keyword is a qualifier that tells the compiler not to optimize when applied to a variable. By declaring a variable volatile, we can tell the compiler that the value of the variable may change any moment from outside of the scope of the program. A variable should be declared volatile whenever its value could change unexpectedly and beyond the comprehension of the compiler.	Understand	CO 2	CLO 7	AEC024.7
29	What Is Size Of Character, Integer, Integer Pointer, Character Pointer?	The sizeof 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 2	CLO 7	AEC024.7
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 2	CLO 7	AEC024.7
31	What Are The Uses Of The Keyword Static?	Static keyword can be used with variables as well as functions. A variable declared static will be of static storage class and within a function, it maintains its value between calls to that function. A variable declared as static within a file, scope of that variable will be within that file, but it can't be accessed by other files.	Remember	CO 2	CLO 7	AEC024.7
32	What Are The Uses Of The	Volatile keyword is used to prevent compiler to optimize	Remember	CO 2	CLO 7	AEC024.7

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	Keyword Volatile?	a variable which can change unexpectedly beyond compiler's comprehension. Suppose, we have a variable which may be changed from scope out of the program, say by a signal, we do not want the compiler to optimize it. Rather than optimizing that variable, we want the compiler to load the variable every time it is encountered. If we declare a variable volatile, compiler will not cache it in its register.				
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.	Understand	CO 2	CLO 7	AEC024.7
34	What Happens When Recursive Functions Are Declared Inline?	Inlining an recursive function reduces the overhead of saving context on stack. But, inline is merely a suggestion to the compiler and it does not guarantee that a function will be inlined. 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.	Understand	CO 2	CLO 7	AEC024.7
35	What Is Job Of Preprocessor, Compiler, Assembler And Linker ?	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. Once compiler completes its work, the assembler takes the assembly code and produces an assembly listing with offsets and generate object files.The linker combines object files or libraries and	Remember	CO 2	CLO 6	AEC024.6

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		produces a single executable file. It also resolves references to external symbols, assigns final addresses to functions and variables, and revises code and data to reflect new addresses.				
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 2	CLO 6	AEC024.6
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.	Understand	CO 2	CLO 6	AEC024.6
38	What Is Wild Pointer?	A pointer that is not initialized to any valid address or NULL is considered as wild pointer. Consider the following code fragment -int *p;*p = 20;Here p is not initialized to any valid address and still we are trying to access the address. The p will get any garbage location and the next statement will corrupt that memory location.	Remember	CO 2	CLO 6	AEC024.6
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 2	CLO 6	AEC024.6
40	What is the endianness?	The endianess is the order of bytes to store data in memory and it also describes the order of byte transmission over a digital link. In memory data store in which order it depends on the endianness of	Remember	CO 2	CLO 6	AEC024.6

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		the system, if the system is big-endian then the MSB byte store first (means at lower address) and if the CLO 8system is little-endian then LSB byte store first (means at lower address).				
	UNIT-III EMBEDDED C APPLICATIONS					
1	What is Keil MicroVision?	Keil MicroVision is a free software which solves many of the pain points for an embedded program developer. This software is an integrated development environment (IDE), which integrated a text editor to write programs, a compiler and it will convert your source code to hex files too	Understand	CO 3	CLO 10	AEC024.10
2	Define Keil MDK	**Keil MDK** is the complete software development environment for a wide range of Arm Cortex-M based microcontroller devices. **MDK** includes the µVision IDE and debugger, Arm C/C++ compiler, and essential middleware components.	Understand	CO 3	CLO 10	AEC024.10
3	What do you mean by IDE?	An integrated development environment (**IDE**) is a software suite that consolidates basic tools required to write and test software.	Understand	CO 3	CLO 10	AEC024.10
4	Define Super loop.	while(1) // ‑for everø (Super Loop)	Remember	CO 3	CLO 9	AEC024.9
5	Define Performance Analyzer functions.	To determine the speed at which the code will execute on the real system, you need to use the ‑Performance Analyzerø functions provided in the simulator	Understand	CO 3	CLO 11	AEC024.11
6	Define pull up resistor.	When the switch is open, it has no impact on the port pin. An internal resistor on the port ‑pulls upø the pin to the supply voltage of the microcontroller (typically 5V). If we read the pin, we will see the value ‑1ø	Understand	CO 3	CLO 9	AEC024.9
7	Define Project Header.	The ‑Project Headerø is simply a header file, included in all projects, that groups the key information about the 8051 device you have used, along with other	Remember	CO 3	CLO 12	AEC024.12

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		key parameters ó such as the oscillator frequency ó in one file				
8	Define device header	The first entry in the project header is the link to the appropriate ÷device headerø file. These files will, in most cases, have been produced by your compiler manufacturer, and will include the addresses of the special function registers (SFRs) used for port access, plus similar details for other on-chip components such as analog-to-digital converters.	Understand	CO 3	CLO 12	AEC024.12
9	Define Switch bounce.	In practice, all mechanical switch contacts *bounce* (that is, turn on and off, repeatedly, for a short period of time) after the switch is closed or opened.	Understand	CO 3	CLO 9	AEC024.9
UNIT-IV **INTRODUCTION TO REAL-TIME OPERATING SYSTEMS**					
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.	Understand	CO 4	CLO 16	AEC024.16
2	What is meant by Process Control Block?	It is a data structure which contains all the information and components regarding with the process.	Understand	CO 4	CLO 16	AEC024.16
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.	Understand	CO 4	CLO 17	AEC024.17
4	Define Task state.	It has states in the system as follows: idle, ready, running, blocked and finished.	Remember	CO 4	CLO 17	AEC024.17
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 4	CLO 17	AEC024.17
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	Understand	CO 4	CLO 16	AEC024.16

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		the execution of the program is called a thread.				
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.	Understand	CO 4	CLO 15	AEC024.15
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.	Understand	CO 4	CLO 17	AEC024.17
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.	Understand	CO 4	CLO 17	AEC024.17
10	Define Mutex.	Mutex is a semaphore that gives at an instance two tasks mutually exclusive access to resources.	Remember	CO 4	CLO 16	AEC024.16
11	Differentiate counting semaphore and binary semaphore.	**Binary 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 4	CLO 17	AEC024.17
12	What is Priority inversion?	A problem in which a low priority task inadvertently does not release the process for a higher priority task.	Remember	CO 4	CLO 16	AEC024.16
13	What is Deadlock situation?	A set of processes or threads is deadlocked when each process or thread is waiting for a resource to be freed which is controlled by another process.	Understand	CO 4	CLO 17	AEC024.17

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
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.	Understand	CO 4	CLO 17	AEC024.17
15	Define Mailbox.	A mailboxes are software-engineering components used for interprocess communication, or for inter-thread communication within the same process.	Remember	CO 4	CLO 15	AEC024.15
16	Define Socket.	It provides the logical link using a protocol between the tasks in a client server or peer to peer environment.	Understand	CO 4	CLO 15	AEC024.15
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.	Understand	CO 4	CLO 15	AEC024.15
18	What are the goals of RTOS?	Facilitating easy implantation of the application software Maximizing system performance Providing management functions for the processes, memory, and I/Os and for other functions for which it is designed. Providing management and organization functions for the devices and files and file like devices. Portability.	Understand	CO 4	CLO 16	AEC024.16
19	What is RTOS?	An RTOS is an OS for response time controlled and event controlled processes. RTOS is an OS for embedded systems, as these have real time programming issues to solve.	Understand	CO 4	CLO 16	AEC024.16
20	List the functions of a kernel.	Process management Process Creation to deletion Processing resource requests Scheduling Memory management I/O managent Device management	Understand	CO 4	CLO 17	AEC024.17
21	List the set of OS Command functions for a	Create and open Write Delete	Remember	CO 4	CLO 15	AEC024.15

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	device.	Close and delete				
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 4	CLO 17	AEC024.17
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 4	CLO 16	AEC024.16
24	Define CPU schedulin g.	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 4	CLO 17	AEC024.17
25	Define Synchronization.	Message passing can be either blocking or non-blocking. Blocking is considered to be synchronous and non-blocking is considered to be asynchronous.	Understand	CO 4	CLO 15	AEC024.15
26	Define Inter process communication.	Inter-process communication (IPC) is a set of techniques for the exchange of data among multiple threads in one or more processes. Processes may be running on one or more computers connected by a network.	Remember	CO 4	CLO 15	AEC024.15
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.	Understand	CO 4	CLO 15	AEC024.15
28	Define Semaphore.	Semaphore is simply a variable. This variable is used to solve the critical section	Understand	CO 4	CLO 17	AEC024.17

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		problem and to achieve process synchronization in the multiprocessing environment.				

29	Give syntax for wait semaphore.	The classic definition of _wait
		Wait(s)
		{
		While(S<=0);
		S--;
		}
			Remember	CO 4	CLO 17	AEC024.17

30	Give syntax for signal semaphore.	The classic definition of signal
		Signal(S)
		{
		S++;
		}
			Remember	CO 4	CLO 17	AEC024.17

31	Give the operations of semaphore.	The two operations can be performed by semaphore. i.e. Wait and signal.	Remember	CO 4	CLO 17	AEC024.17
32	Give the semaphore related functions.	A semaphore enforces mutual exclusion and controls access to the process critical sections. Only one process at a time can call the function. SR Program: A Semaphore Prevents the Race Condition. SR Program: A Semaphore Prevents Another Race Condition	Understand	CO 4	CLO 17	AEC024.17
33	Define Message Queue.	A message queue is a buffer managed by the operating system. Message queues allow a variable number of messages, each of variable length, to be queued. Tasks and ISRs can send messages to a message queue, and tasks can receive messages from a message queue (if it is nonempty).	Remember	CO 4	CLO 15	AEC024.15
34	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.	Understand	CO 4	CLO 17	AEC024.17
35	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	Understand	CO 4	CLO 16	AEC024.16

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
36	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.	Understand	CO 4	CLO 16	AEC024.16
37	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	Understand	CO 4	CLO 16	AEC024.16
38	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 4	CLO 16	AEC024.16
39	Define interpreter.	An interpreter does expression (line by line) transulation to the machine executable codes.	Remember	CO 4	CLO 17	AEC024.17
40	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 4	CLO 17	AEC024.17
41	Define dissembler	A dissembler translates the object codes into the mnemonics form of assembly language. It helps in understanding the previously made object code.	Understand	CO 4	CLO 17	AEC024.17
42	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	Understand	CO 4	CLO 17	AEC024.17

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		smartphone is a cross compiler. but generates code that runs on Android smartphone is a cross compiler.				
43	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 4	CLO 17	AEC024.17
44	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.	Understand	CO 4	CLO 17	AEC024.17
45	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.	Understand	CO 4	CLO 16	AEC024.16
46	Expand IDE	Integrated Development Environment.	Remember	CO 4	CLO 17	AEC024.17
47	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 4	CLO 16	AEC024.16
48	What is the application of development kit in software tools.	Development kit is used for editing, configuring, GUIs development and compiling.	Understand	CO 4	CLO 16	AEC024.16
49	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.	Understand	CO 4	CLO 17	AEC024.17
50	Write laboratory tools.	The examples of laboratory tools are simple volt-ohm meter, LED tests and logic probes, oscilloscope etc.	Remember	CO 4	CLO 17	AEC024.17
UNIT-V INTRODUCTION TO ADVANCED ARCHITECTURES						
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	Remember	CO 5	CLO 19	AEC024.19

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		byte, NACK and end.				
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 5	CLO 19	AEC024.19
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 5	CLO 19	AEC024.19
4	State the special features on I 2 C	É Low cost ÉEasy implementation ÉModerate speed upto 100 kbps	Understand	CO 5	CLO 19	AEC024.19
5	What are the disadvantages of I2C?	É Slave hardware does not provide much support ÉOpen collector drivers at the master leads to be confused	Understand	CO 5	CLO 19	AEC024.19
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 5	CLO 18	AEC024.18
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 5	CLO 18	AEC024.18
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.	Understand	CO 5	CLO 18	AEC024.18
9	Define Serial bus protocol.	In telecommunication and data transmission, serial communication is the process of sending data one	Understand	CO 5	CLO 19	AEC024.19

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		bit at a time, sequentially, over a communication channel or computer bus. examples of serial bus protocol are CAN, I 2C, USB.				
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 a few centimeters.	Understand	CO 5	CLO 19	AEC024.19
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.	Understand	CO 5	CLO 20	AEC024.20
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.	Understand	CO 5	CLO 19	AEC024.19
13	Define memory organization.	Memory organization defines how memory space is organized for a microprocessor/microcontroller.	Remember	CO 5	CLO 18	AEC024.18
14	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 5	CLO 18	AEC024.18
15	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	Remember	CO 5	CLO 18	AEC024.18

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		gain compared to processors from just five years ago, or 3.5 times the performance gain of the ARM Cortex-A15 processor.				
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	Understand	CO 5	CLO 19	AEC024.19
17	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.	Understand	CO 5	CLO 19	AEC024.19
18	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 5	CLO 18	AEC024.18
19	Draw the data frame format of CAN?		Remember	CO 5	CLO 19	AEC024.19
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 5	CLO 18	AEC024.18
21	Demonstrate the important embedded Proccessor	An embedded processor is Processor designed especially for handling the needs of an embedded system. An ordinary microprocessor only comes with the processor in the chip. The peripherals are	Understand	CO 5	CLO 18	AEC024.18

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		separate from the main chip, resulting in more power consumption.				
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 5	CLO 18	AEC024.18
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 5	CLO 19	AEC024.19
24	Give the size of ARM flash memory	512 Kbytes embedded Flash λ 96 Kbytes embedded SRAM	Remember	CO 5	CLO 18	AEC024.18
25	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 5	CLO 20	AEC024.20
26	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 5	CLO 20	AEC024.20
27	Define bus.	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.,	Remember	CO 5	CLO 18	AEC024.18

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		16 lines for a 16 bit address bus. There will be address, control, and data buses.				
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.	Understand	CO 5	CLO 20	AEC024.20
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.	Understand	CO 5	CLO 19	AEC024.19
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 5	CLO 18	AEC024.18
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 5	CLO 19	AEC024.19
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.	Understand	CO 5	CLO 19	AEC024.19
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.	Understand	CO 5	CLO 20	AEC024.20
34	Write about Presentation layer.	The most important function of this layer is defining data formats such as ASCII text,	Understand	CO 5	CLO 20	AEC024.20

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		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.				
35	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.	Understand	CO 5	CLO 20	AEC024.20
36	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.	Understand	CO 5	CLO 20	AEC024.20
37	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.	Understand	CO 5	CLO 20	AEC024.20
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.	Understand	CO 5	CLO 20	AEC024.20
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.	Understand	CO 5	CLO 20	AEC024.20
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	Remember	CO 5	CLO 19	AEC024.19

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		frames standard or extended .These frames can be differentiated on the basis of identifier fields.				

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