

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

QUESTION BANK



VII SEMESTER

EE8691 – EMBEDDED SYSTEMS

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SUBJECT : EE8691 – EMBEDDED SYSTEMS

SEM / YEAR: VII / IV

UNIT I - INTRODUCTION TO EMBEDDED SYSTEMS

Introduction to Embedded Systems - Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

PART-A

Q.No	Questions	BT Level	Competence
1.	List the characteristics of an embedded system.	1	Remember
2.	Name some of the hardware components of Embedded system.	1	Remember
3.	Write the purpose of timing and counting devices	5	Evaluate
4.	Identify the use of DMAC.	3	Apply
5.	Explain the important considerations when selecting a processor.	4	Analyze
6.	What is Real Time Clock?	1	Remember
7.	Classify the methods of memory management system.	4	Analyze
8.	What is a Compiler?	1	Remember
9.	Give the purpose of Watch dog timer.	2	Understand
10.	Define In circuit emulator.	5	Evaluate
11.	Justify the Need of Target Hardware debugging.	6	Create
12.	Explain the abbreviation term MAR and MDR	2	Understand
13.	Compare embedded system and non-embedded system with examples.	4	Analyze
14.	Explain Simulator.	2	Understand
15.	Define DMA.	1	Remember
16.	Distinguish between CISC and RISC.	2	Understand
17.	Classify the types of processors in Embedded System.	3	Apply
18.	Define Embedded system.	1	Remember
19.	How can an embedded system be illustrated?	3	Apply
20.	Write about memory management system used in Embedded system.	6	Create

PATR-B

1.	How do you select processor for different application of Embedded system? (13)	1	Remember
2.	Explain the classification of embedded systems with examples. (13)	1	Remember
3.	Outline the process of memory allocation for different application of Embedded systems. (13)	1	Remember
4.	Write a short note on	1	Remember
	(i) Timing unit. (7)		
	(ii) Counting devices. (6)		
5.	Describe the advanced architectures of embedded processor with neat diagram. (13)	2	Understand

6.	(i)How much amount of memory required for Embedded systems for different applications. (7) (ii)Compare memory allocation for different application of Embedded system. (6)	2	Understand
7.	With a neat diagram explain the working of Direct Memory Access (DMA) with architecture. (13)	2	Understand
8.	Discuss the following terms in memory management	3	Apply
	(i) Memory allocation and Memory leak. (6)		
	(ii) Methods of Memory management strategy. (7)		
9.	Demonstrate about the memory selection with different case study examples. (13)	3	Apply
10.	Explain the main components of Embedded hardware units with neat diagram. (13)	4	Analyze
11.	Describe about the structural units of processor architecture and advanced processor architecture with neat diagram. (6+7)	4	Analyze
12.	Explain the various forms of memories present in an embedded systems. (13)	4	Analyze
13.	Recommend an embedded processor for any application of your own.(13)	6	Create
14.	With a neat diagram discuss the following terms in Embedded Processor	5	Evaluate
	(i) Watch dog Timer. (6)		
	(ii) Real Time Clock. (7)		
PART – C			
1.	Mention the necessary hardware units that must be present in the embedded systems. (15)	2	Understand
2.	Elaborate about Structural unit of Embedded Processor including processor architecture and advanced processor architecture. (15)	5	Evaluate
3.	Analyze in detail with suitable diagram for	3	Apply
	(i) In Circuit Emulator. (7)		
	(ii) Target Hardware Debugging. (8)		
4.	Discuss in detail about Timer and counting devices for Embedded systems with neat diagram. (15)	5	Evaluate

UNIT II - EMBEDDED NETWORKING

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols - RS232 standard – RS422 – RS485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I²C) –need for device drivers.

PART – A

Q.No	Questions	BT Level	Competence
1.	What is half duplex communication?	1	Remember
2.	Give the limitations of polling techniques.	2	Understand
3.	What is a CAN bus? Where is it used?	1	Remember
4.	How do the following indicate the start and end of a byte or data frames? (a) I ² C (b) CAN	3	Apply
5.	State the special features of I ² C.	1	Remember
6.	Mention few serial bus communication protocols.	1	Remember
7.	Distinguish between Synchronous and Asynchronous communication.	2	Understand
8.	Draw the write byte format and read byte format of I ² C.	2	Understand

9.	Classify I/O devices in embedded system.	3	Apply
10.	What are the two characteristics of synchronous communication?	1	Remember
11.	Difference between RS422 and RS485.	4	Analyze
12.	Differentiate between RS232 and RS485.	2	Understand
13.	Explain about the limitations of I ² C.	5	Evaluate
14.	Justify the need for RS-485.	6	Create
15.	Analyze the concept of RS232 standard.	4	Analyze
16.	Write about SPI serial interfaces.	1	Remember
17.	Compare the buses used in serial communication.	4	Analyze
18.	Draw the data frame format of CAN.	3	Apply
19.	What is the need for device driver? Justify it.	6	Create
20.	Define device driver.	5	Evaluate

PART-B

1.	(i)	Describe the functions of a typical parallel I/O interface with a neat diagram. (8)	1	Remember
	(ii)	Explain the classification of IO devices. (5)		
2.		Elaborate the architecture of CAN with necessary sketches (13)	4	Analyze
3.		Write a short note on		Remember
	(i)	Serial communication protocol. (7)	1	
	(ii)	Parallel communication protocol. (6)		
4.		Explain in detail about serial bus communication protocols. (13)	2	Understand
5.		With neat diagram, explain about EIA 485 standard Configuration. (13)	5	Evaluate
6.		Demonstrate about how serial data communication is preferred in I ² C bus. (13)	2	Understand
7.		Tabulate the difference between the EIA 232, EIA 485 and EIA 422 standard. (13)	1	Remember
8.	(i)	Illustrate the asynchronous serial input communications from serial devices. (7)	3	Apply
	(ii)	Illustrate the asynchronous serial output communications from serial devices. (6)		
9.		Explain in detail about SPI communication protocol and its interfacing techniques. (13)	1	Remember
10.		Explain with all necessary sketches to enable intra communications among peripherals using I ² C bus. (13)	6	Create
11.		Explain in detail about		
	(i)	Synchronous serial input communications. (7)	4	Analyze
	(ii)	Synchronous serial output communications. (6)		
12.		Discuss the types of serial communication devices. (13)	2	Understand
13.	(i)	Describe about the EIA 422 standard Configuration with neat diagram. (9)	4	Analyze
	(ii)	Summarize the limitations of EIA 422 standard configuration. (4)		
14.		Illustrate the EIA -232 interface standard and major elements of EIA -232 with the help of neat diagram. (13)	3	Apply

PART-C

1.	Describe one type of serial communication bus with its communication protocol. (15)	2	Understand
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2.	Design the Half-duplex operational sequence of EIA -232 with neat flow sketch between DTE and DCE over public switched telephone network. (15)	6	Create
3.	Demonstrate the signal using a transfer of byte when using the I ² C bus and also the format of bits at the I ² C bus with diagram. (15)	1	Remember
4.	Why we need device driver? How do you write a device driver? List the steps involved in writing a device driver. (15)	4	Analyze

UNIT III - EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

PART-A			
Q.No	Questions	BT Level	Competence
1.	List the different phases in EDLC.	1	Remember
2.	Mention different models used for the development of an embedded system.	2	Understand
3.	Summarize the objective of EDLC.	2	Understand
4.	Point out the features of Linear or Water fall Model.	5	Evaluate
5.	Classify the 3 categories of product development.	3	Apply
6.	Define Conceptualization phase.	1	Remember
7.	Define Product design phase and development phase.	1	Remember
8.	Elucidate on data flow graph.	5	Evaluate
9.	What is meant by need?	1	Remember
10.	What are the activities performed in deployment phase?	1	Remember
11.	Why is state model essential?	4	Analyze
12.	Define Evolutionary Model.	3	Apply
13.	What is state machine model?	4	Analyze
14.	What are the differences between data flow model and finite state model?	2	Understand
15.	State Object Oriented Model.	1	Remember
16.	Summarize the advantages and disadvantages of Linear or Water fall model.	2	Understand
17.	Analyze the issues of hardware-software co-design.	4	Analyze
18.	Mention the different types of product development. What are the processes involved in Co-Design?	6	Create
19.	Justify the quality of products.	6	Create
20.	Define Concurrent Model.	3	Apply
PART – B			
1.	Explain in detail about Embedded Product Development Life Cycle(EDLC). (13)	3	Apply
2.	Mention the essential and objectives of Embedded Product Development Life Cycle(EDLC). (13)	2	Understand
3.	Demonstrate about the State Machine Model of an Automatic Tea Vending Machine with suitable example. (13)	4	Analyze

4.	(i)	Describe Data Flow Graph model and Control Data Flow Graph model with a suitable example. (7)	1	Remember
	(ii)	Describe State Machine model with suitable example. (6)		
5.	Name the different phases of ELDC and explain EDLC model with neat diagram. (13)		2	Understand
6.	Discuss in detail about the different phases of EDLC. (13)		5	Evaluate
7.	(i)	Describe in detail explain the Waterfall model and Incremental or Fountain Model with suitable flowchart. (7)	1	Remember
	(ii)	Describe in detail explain the Evolutionary model and spiral Model with suitable flow chart. (6)		
8.	Discuss in detail about Hardware Software co-Design and program modelling. (13)		3	Apply
9.	Discuss about the fundamental issues in Hardware and Software Co-Design. (13)		5	Evaluate
10.	(i)	Explain about sequential program model for the development of embedded platform. (6)	1	Remember
	(ii)	With a suitable example, explain about the State Machine model of embedded platform. (7)		
11.	(i)	Write detailed notes on Linear and iterative model in EDLC. (7)	2	Understand
	(ii)	Explain about prototyping model and spiral model in EDLC. (6)		
12.	(i)	Explain about Concurrent Process Model with suitable diagram.(6)	1	Remember
	(ii)	Explain the Object Oriented Model with suitable example. (7)		
13.	Illustrate the following type of computational state model		4	Analyze
	(i)	Data Flow Graph Type Model. (3)		
	(ii)	State Diagram Type Model. (3)		
	(iii)	Concurrent Process Model. (3)		
	(iv)	Sequential Program Model. (4)		
14.	Explain the Sequential Model Program for seat belt warning system with suitable flow chart. (13)		6	Create
PART – C				
1.	Evaluate functional description about the different phases of Embedded Design Life Cycle Method. (15)		3	Apply
2.	Analyze the various modeling of EDLC With neat flow chart. (15)		4	Analyze
3.	Analyze the various computational models in embedded design with suitable example. (15)		2	Understand
4.	With a neat diagram, explain about State Machine Model for seat belt alarm system. (15)		6	Create

UNIT IV - RTOS BASED EMBEDDED SYSTEM DESIGN

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Pre-emptive and non-pre-emptive scheduling, Task communication-shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance

PART-A

Q.No	Questions	BT Level	Competence
1.	Define task and task state.	1	Remember
2.	Demonstrate the interrupt latency.	3	Apply
3.	What is multithreading?	1	Remember
4.	Differentiate pre-emptive and non pre-emptive multitasking.	5	Evaluate
5.	Define real time operating system.	1	Remember
6.	Point out the consequences of context switching.	4	Analyze
7.	What are the functions of RTOS?	1	Remember
8.	Define multi-rate embedded system.	2	Understand
9.	Compare the release time and deadline.	4	Analyze
10.	Elucidate semaphore with syntax.	5	Evaluate
11.	Compare pre-emptive and non pre-emptive scheduling.	2	Understand
12.	Classify the three basic scheduling states in OS.	3	Apply
13.	Define scheduling policy.	1	Remember
14.	List any four applications of Micro Controller Operating System MUCOS.	2	Understand
15.	Compare user threads and kernel threads.	4	Analyze
16.	Justify the use of a thread in a process.	6	Create
17.	Discuss the concept of message passing.	2	Understand
18.	Define shared data problem.	1	Remember
19.	How can a scheduling process be explained in real time?	6	Create
20.	Examine the various performance issues in RTOS based embedded system design.	3	Apply
PART-B			
1.	Describe the real time operating systems. Compare its features with window based real time operating systems. (13)	1	Remember
2.	Discuss about the basic concepts for RTOS based Embedded system design. (13)	2	Understand
3.	Show the appropriate diagrams explain multiple tasks and multiple processes. (13)	6	Create
4.	Write brief notes on (i) Pre-emptive multitasking. (6) (ii) Non-pre-emptive multitasking. (7)	1	Remember
5.	With an example describe the different methods of Task scheduling algorithm. (13)	1	Remember
6.	(i) Discuss critical section service by a pre-emptive scheduler. (7) (ii) Describe the three alternative systems in three RTOS for responding a hardware source call with the diagram. (6)	2	Understand
7.	(i) List out the goals of operating system services. (5) (ii) Generalize the scheduler in which RTOS insert into the list and the ready task for sequential execution in a co-operative round robin model. (8)	4	Analyze

8.	Show the appropriate diagrams explain Task Communication and Synchronization. (13)		3	Apply
9.	(i)	Generalize the various scheduling policies with example. (7)	4	Analyze
	(ii)	With an example describe rate monotonic scheduling. (6)		
10.	Explain in detail about the Inter process Communication and Context Switching. (13)		2	Understand
11.	Discuss about the basic concepts for Inter Process Communication .(13)		5	Evaluate
12.	Summarize the system level and task service functions of		4	Analyze
	(i)	Priority inversion. (6)		
	(ii)	Priority inheritance. (7)		
13.	Explain how the interrupt routines are handled by RTOS. (13)		1	Remember
14.	Explain the following		3	Apply
	(i)	Mailbox and message for inter process communication. (8)		
	(ii)	Pipe and queue for multitasking. (5)		
PART-C				
1.	Explain task, process and thread with their types and examples which aids the real time system. (15)		2	Understand
2.	Analyze interrupt handling mechanism for (i) Polling (ii) Wait States (iii) Interrupt. (15)		1	Remember
3.	Analyze the various terminologies given below (i) Semaphores (ii) Mail box (iii) Pipes (iv) Shared memory RTOS. (15)		1	Remember
4.	Define the term Multitasking. How the multitasking is distinguished with multiprocessing. (15)		6	Create

UNIT V - EMBEDDED SYSTEM APPLICATION DEVELOPMENT

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM Machines-Digital Camera

PART-A

Q.No	Questions	BT Level	Competence
1.	What is meant by smart card? What are the events involved in smart card application?	1	Remember
2.	State the basic requirements while designing an embedded system.	1	Remember
3.	Show the architectural hardware units needed in automotive applications.	3	Apply
4.	List some evident examples of Real time embedded application.	1	Remember
5.	What is the hardware units needed to design smartcard?	5	Evaluate
6.	State the tasks for smartcard.	1	Remember
7.	Integrate the various types of memory units that must be present in smartcard, adaptive cruise control and washing machine.	2	Understand
8.	Show the architectural hardware units needed in washing machine.	3	Apply
9.	Name the software units needed to design Digital Camera.	1	Remember
10.	Draw the system components in the smart card.	3	Apply
11.	Summarize the applications of embedded system.	2	Understand
12.	Points out the various inter process communication methods required in implementing the washing machine.	4	Analyze

13.	What is the hardware units needed to design adaptive cruise control?	2	Understand
14.	Discuss the design specification for automatic washing machine.	5	Evaluate
15.	What is the software units needed to design Automotive application?	2	Understand
16.	Justify the need for watchdog timer.	6	Create
17.	Analyze the major function of timer device in an Automotive application.	4	Analyze
18.	Define the tasks for an ATM.	1	Remember
19.	Recommend the different task for washing machine.	6	Create
20.	Explain the various inter process communication methods required in implementing the smartcard.	4	Analyze

PART – B

1.	Elucidate the selection of processor and memory for any one embedded applications with suitable diagram in detail. (13)	5	Evaluate
2.	With suitable diagram explain in detail about the concept of washing machine application for Embedded system. (13)	6	Create
3.	Tabulate hardware units needed in each of the systems: Smart card, Automotive applications, Washing machine. (13)	4	Analyse
4.	Discuss the case study an adaptive cruise control system with neat diagram. (13)	6	Create
5.	List various types of memories and the application of each in the following systems: Automotive applications, Smart card, and Washing machine. (13)	4	Analyse
6.	Show and explain basic system of Automotive applications. (13)	6	Create
7.	Apply suitable hardware and software to develop the embedded system for a smart card. (13)	6	Create
8.	(i)With suitable diagram explain in detail about the concept of Smart Card System Application. (7) (ii) Design architectural hardware and software units needed in smart card. (6)	6	Create
9.	(i)With suitable Hardware and Software explain the case study for a High end CAR using Embedded System. (6) (ii) Identify the tasks for a High end CAR. Explain the various inter process communication methods required in implementing the application. (7)	6	Create
10.	With suitable diagram explain in detail about the concept of Automated Teller Machine. (13)	1	Remember
11.	Identify and explain hardware units needed in digital camera. (13)	2	Understand
12.	Discuss case study an ambulance vehicle with class diagram. (13)	4	Analyse
13.	With suitable hardware and software explain the Digital Camera of the automotive embedded application domain. (13)	6	Create
14.	With a suitable example, explain about an Automatic Chocolate Vending Machine. (13)	6	Create

PART – C

1.	Create the block diagram for the case study of Embedded System for an Adaptive Cruise Control Systems in a car. (15)	6	Create
2.	With suitable Hardware and Software explain the case study for an ATM Machine using Embedded System. (15)	6	Create
3.	With suitable Hardware and Software explain the case study for a	6	Create

	Washing Machine using Embedded System. (15)		
4.	Design and discuss an embedded system solution for a typical automotive system. Your answer must include design and development of necessary hard wares and software for an automotive system to incorporate efficient fuel management systems, vehicle performance monitoring systems, and vehicle tracking and navigation systems. (15)	6	Create

