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Subject Code:- AEC0512

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2024- 2025)

Subject: Embedded System Design

Time: 3 Hours Max. Marks: 100

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A 20

1. Attempt all parts:-

1-a. Which of the following is NOT a characteristic of embedded systems? (CO1,K1) 1

(a) Single functioned

(b) Real Time

(c) Low Power

(d) No Cost Limit

1-b. When did the first embedded system, the Apollo Guidance Computer, get developed? (CO1,K1) 1

(a) 1960

(b) 1965

(c) 1968

(d) 1970

1-c. Change in output of sensor with change in input is_____ (CO2,K1) 1

(a) Threshold

(b) Sensitivity

(c) Slew Rate

(d) None of mentioned

1-d. Which communication protocol is NOT supported by STM32F401? (CO2,K1) 1

(a) I2C

(b) SPI

(c) CAN
(d) USART

1-e. What does ARM stand for? (CO3,K3) 1

(a) Advanced RISC Machine
(b) Advanced Register Machine
(c) Architectural RISC Machine
(d) Advanced Reduced Machine

1-f. Which instruction set does ARM architecture primarily support? (CO3,K3) 1

(a) RISC
(b) CISC
(c) VLIW
(d) SIMD

1-g. Which directive is used to define global variables in ARM assembly? (CO4,K4) 1

(a) .data
(b) .global
(c) .bss
(d) .text

1-h. Which file extension is commonly used for assembly programs in ARM Cortex-M4? (CO4, K4) 1

(a) .asm
(b) .s
(c) .txt
(d) .c

1-i. Who created Linux? (CO5,K2) 1

(a) Dennis Ritchie
(b) Linus Torvalds
(c) Ken Thompson
(d) Richard Stallman

1-j. Which Linux component handles hardware communication? (CO5, K2) 1

(a) User-space applications
(b) Kernel
(c) Shell
(d) Libraries

2. Attempt all parts:-

2.a. Define an embedded system and give two examples. (CO1, K1) 2

2.b. What is LDR (Light Dependent Resistor) sensor? (CO2, K1) 2

2.c. What is Program Counter (PC)? (CO3,K3) 2

2.d. Explain ARM Instruction format? (CO4,K3) 2

2.e.	What is the function of the init process in the Linux startup sequence? (CO5, K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	What are the main components of an embedded system? Explain the role of each component. (CO1,K1)	6
3-b.	Explain the importance of power management in embedded systems. How can power consumption be minimized? (CO1,K2)	6
3-c.	Explain the process of interfacing a 7-segment LED display with the STM32F401 Nucleo Board to display numeric data. (CO2, K3)	6
3-d.	Explain Output Devices in Embedded Systems. (CO2, K1)	6
3.e.	Explain Wakeup Interrupt Controller (WIC) in ARM Cortex-M4-based systems. (CO3, K3)	6
3.f.	What is CMSIS? Describe its components and explain how it simplifies programming for ARM Cortex-M4 processors. (CO4, K3)	6
3.g.	Compare Embedded Linux and Desktop Linux in terms of resource constraints, boot time, and application areas. (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	What are the advantages and disadvantages of using embedded systems? Explain. (CO1, K2)	10
4-b.	Write short notes on: (CO1,K1) a) RAM & ROM b) Input Devices c) Design Considerations of Embedded Systems	10

5. Answer any one of the following:-

5-a.	Explain STM32F401 Nucleo Board in detail. (CO2, K1)	10
5-b.	Discuss how the STM32F401's ADC (Analog-to-Digital Converter) can be used to interface with analog sensors. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	What is the function of the Nested Vectored Interrupt Controller (NVIC) in the ARM Cortex-M4? Explain with the help of block diagram. (CO3,K3)	10
6-b.	Explain the general-purpose registers (R0–R12) in the ARM Cortex-M4 processor. How are these registers used during program execution? (CO3, K4)	10

7. Answer any one of the following:-

7-a.	What is the CMSIS and how does it simplify embedded system development for ARM processors? (CO4,K3)	10
7-b.	Compare and contrast the use of C and Assembly programming languages in embedded systems development. What are the scenarios where each language is preferred? (CO4,K4)	10

8. Answer any <u>one</u> of the following:-

8-a.	Explain the architecture of the Ethernet driver in Linux. (CO5,K1)	10
8-b.	Describe the Linux start-up sequence from power-on to reaching the user-space. Include the roles of the Bootloader, Kernel and Init process. (CO5,K4)	10