Embedded System (315338)

MSBTE Diploma · K-Scheme · Model Question Paper — Set A

Time: 3 Hours **Max. Marks: 70**

Instructions:

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following: **10**

a) Define embedded system. Give any two examples.

b) List any four features of the Arduino-specific AVR microcontroller ATmega328.

c) Differentiate between serial and parallel communication. (Any two points)

d) Define Real Time Operating System (RTOS). Name any two RTOS.

e) State the purpose of watchdog timer in an embedded system.

f) Explain the use of pinMode( ) and digitalRead( ) functions in Arduino.

g) State any four features of Arduino Uno board.

Q.2 Attempt any THREE of the following: **12**

a) Compare PIC, AVR and ARM microcontrollers. (Any four points)

b) Explain the following selection criteria of an embedded system: i) NRE cost ii) Time to market iii) Size iv) Correctness and safety

c) Compare hard real-time and soft real-time systems. (Any four points)

d) Draw the interfacing diagram of a DC motor with Arduino Uno using L293D and explain its working.

Q.3 Attempt any THREE of the following: **12**

a) Draw and explain the block diagram of a basic embedded system.

b) With suitable data frame format, explain the CAN protocol.

c) Explain how deadlock occurs in an RTOS with a suitable example. State any two strategies to handle it.

d) Explain any four mathematical functions used in Arduino programming with syntax and example.

Q.4 Attempt any THREE of the following: **12**

a) Draw the internal architecture of ATmega8 microcontroller and explain any four blocks.

b) Explain the publisher–subscriber model of IEC 61850 GOOSE protocol. State its significance in electric power systems.

c) Compare Zigbee and Bluetooth protocols. (Any four points)

d) Explain Round Robin scheduling. Draw the Gantt chart for tasks T1, T2 and T3 with execution times 5 ms, 3 ms and 4 ms (all ready at t = 0) for a time slice of 2 ms.

e) Write an Arduino program to read temperature from LM35 sensor and display it on the serial monitor.

Q.5 Attempt any TWO of the following: **12**

a) Explain I²C protocol with frame format and timing diagram. State two advantages and two disadvantages.

b) Classify embedded systems. Explain small scale, medium scale and sophisticated embedded systems with one example each.

c) Write a program to interface a relay module with Arduino to control an AC lamp. Explain the hardware connections with interfacing diagram.

Q.6 Attempt any TWO of the following: **12**

a) Explain the programming configuration of ATmega8 for I/O ports and Timer0. Write an embedded C program to toggle an LED on PB0 approximately every 0.5 s using Timer0.

b) Write a note on LoRa communication protocol highlighting its: i) Working ii) Advantages iii) IoT uses.

c) Describe task management in RTOS with task state diagram. Explain inter-task communication.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in