

Embedded System (315338)

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

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) State any four applications of embedded systems in different fields.
- b) Mention any two communication protocols supported by AVR microcontrollers with one feature of each.
- c) State the need of watchdog timer in an embedded system.
- d) State any four features of Arduino Mega board.
- e) State any two differences between I²C and SPI protocols.
- f) Explain the use of analogRead() and analogWrite() functions in Arduino.
- g) Define deadlock. List the four necessary conditions for deadlock.

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

- a) Explain any four advantages of PIC microcontroller over 8051 microcontroller.
- b) Compare general purpose operating system (GPOS) and real time operating system (RTOS). (Any four points)
- c) Explain synchronous and asynchronous serial communication with neat waveforms.
- d) Draw the interfacing diagram of 16×2 LCD with Arduino Uno in 4-bit mode and explain the function of its control pins.

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

- a) Compare ATmega8 and ATmega328 in terms of memory, speed, peripherals and sleep modes.
- b) Explain the following characteristics of an embedded system: CPU type, maximum CPU speed, processing power, memory and performance.
- c) Explain interrupt handling and resource allocation as functions of an RTOS.

- d) Explain the interfacing of ultrasonic sensor HC-SR04 with Arduino with timing diagram. Write the formula to calculate distance.

Q.4 Attempt any THREE of the following:

12

- a) Sketch the block diagram of ATmega8 and describe the function of its memory, I/O port and timer blocks.
- b) Explain USB protocol with respect to topology, features and transfer types.
- c) Explain Round Robin with priority scheduling algorithm. Draw the Gantt chart for: T1 (priority 2, 4 ms), T2 (priority 2, 3 ms) ready at 0 ms and T3 (priority 1, 2 ms) arriving at 4 ms; time slice 2 ms. (Priority 1 is highest.)
- d) Explain Zigbee protocol with its device types and network topologies.
- e) Explain the following selection criteria of an embedded system: i) Operating system ii) Unit cost iii) Time to market iv) Maintainability

Q.5 Attempt any TWO of the following:

12

- a) Explain CAN protocol with respect to bus structure, bus arbitration and data frame format.
- b) Draw the interfacing diagram of 4×4 matrix keypad with Arduino. Write a program to display the pressed key on the serial monitor.
- c) Explain IEC 61850 GOOSE protocol and its significance in electric power system applications.

Q.6 Attempt any TWO of the following:

12

- a) State different types of embedded systems. Describe real-time embedded systems (hard and soft) in detail with examples.
- b) Write an Arduino program to rotate a stepper motor one revolution clockwise and then one revolution anticlockwise. Draw the interfacing diagram.
- c) Write an embedded C program for ATmega328 (register level) to read temperature from LM35 on ADC0 and switch ON a fan connected to PB1 when temperature exceeds 35 °C. Draw the circuit.

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