Embedded System (315338)

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

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 characteristics of an embedded system.

b) State the role of RTC (Real Time Clock) in an embedded system.

c) State any two differences between synchronous and asynchronous communication.

d) List any four features of a microkernel.

e) State the function of the following pins of 16×2 LCD: i) RS ii) E

f) List any four applications of ARM microcontrollers.

g) State any four features of Arduino Nano board.

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

a) Explain the following selection criteria of an embedded system: i) Flexibility ii) Maintainability iii) Reliability iv) Time to prototype

b) Compare RISC and CISC architectures. (Any four points)

c) Explain the following characteristics of RTOS: i) Consistency ii) Reliability iii) Scalability iv) Predictability

d) Draw the interfacing diagram of a common cathode seven segment display with Arduino. Write a program to display digits 0 to 9.

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

a) Draw and explain the layered model of an embedded system.

b) Describe the working of SPI protocol with master–slave configuration. Give any two differences between SPI and I²C.

c) What is a semaphore? Explain binary and counting semaphores with example.

d) Compare Arduino Nano and Arduino Mega boards. (Any four points)

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

a) Draw the AVR microcontroller architecture and describe it in brief.

b) Compare USB and CAN communication protocols. (Any four points)

c) Explain priority-based pre-emptive scheduling. Draw the Gantt chart for: T1 (arrival 0 ms, burst 4 ms, priority 3), T2 (arrival 1 ms, burst 3 ms, priority 1), T3 (arrival 2 ms, burst 2 ms, priority 2). (Priority 1 is highest.)

d) Describe the interfacing of a stepper motor with Arduino using ULN2003. Give the full-step sequence.

e) Justify the use of Zigbee and 6LoWPAN in low-power embedded applications with suitable examples.

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

a) State the purpose of watchdog timer. Draw its block diagram and explain how it is used in AVR microcontroller.

b) Explain deadlock with resource allocation graph. State the necessary conditions for deadlock and explain any two strategies to prevent it in RTOS.

c) Write a program for ATmega328 (Arduino Uno) to read temperature from LM35 and display it on a 16×2 LCD. Draw the interfacing diagram.

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

a) State the sleep modes of AVR (ATmega328) microcontroller and explain any three in detail.

b) Explain the IEC 61850 GOOSE protocol with respect to message transmission, publisher–subscriber model and significance in substation automation.

c) Classify embedded systems based on functional requirements. Explain each with one example.

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