

DipIETE – ET/CS (Current & New Scheme)

Time: 3 Hours

DECEMBER 2018

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (10×2)

- a. A digital circuit designed to execute exactly one program is
(A) Single Purpose Processor
(B) General Purpose Processor
(C) Application Specific Instruction Set Processor
(D) None of these
- b. RTOS is used in most embedded systems when the system does
(A) concurrent processing of multiple real time processes
(B) sequential processing of multiple processes when the tasks have real time constraints
(C) real time processing of multiple processes
(D) concurrent processing of multiple processes, tasks have real time constraints and deadlines, and high priority task preempts low priority task as per the real time constraints.
- c. Which of these, translate assembly instructions to binary machine instructions?
(A) Assembler. (B) Compiler
(C) Debugger (D) None of these
- d. For an 8 bit DAC which has 0 to 10 V as output voltage range, resolution of DAC will be
(A) 11.72V (B) 13.72V
(C) 39mV (D) None of these
- e. The worst choice in terms of write ability is
(A) mask-programmed ROM (B) EPROM
(C) DRAM (D) SRAM

- f. which of the following statement is FALSE?
 (A) Sequential circuit possesses memory
 (B) Combinational circuit also possesses memory
 (C) Basic sequential circuit is flip-flop.
 (D) Multiplexer is the combinational circuit
- g. PCI bus and the ARM bus uses
 (A) Parallel communication protocol (B) Serial communication protocol
 (C) Wireless communication protocol (D) None of the above
- h. Which of the following statement is false?
 (A) Rotating priority arbitration is also called round-robin
 (B) Rotating priority peripheral has a unique rank among all the peripherals
 (C) In rotating priority the arbiter changes priority of peripherals based on the history of servicing of those peripherals
 (D) None of these
- i. Which of the following is not a method of protecting shared data?
 (A) Taking Semaphore (B) Disabling interrupts
 (C) Disabling task switches (D) None of these
- j. Main building block for software written for RTOS environment is
 (A) Task (B) Mutex
 (C) scheduler (D) semaphore

**Answer any FIVE Questions out of EIGHT Questions.
 Each question carries 16 marks.**

- Q.2** a. Explain Design metrics useful in designing an embedded system (6)
- b. List different Processor, IC and Design technologies involved in embedded systems design and explain two IC technologies (10)
- Q.3** a. Explain, why NAND and NOR gates are more common than AND and OR Gates? (2)
- b. Build a 2-input OR gate using a minimum number of CMOS transistors.. (4)
- c. Design a 2-bit comparator (compares two 2-bit words) with a single output "less-than," using the combinational design technique described in the chapter. Start from a truth table, use K-maps to minimize logic, and draw the final circuit.. (10)
- Q.4** a. Create a table listing the address spaces for the following address sizes:
 (a) 16-bit, (b) 32-bit, (c) 24-bit, (d), 64-bit. (4)
- b. Explain briefly the basic stages involved in execution of an instruction by the microprocessor (4)

- c. Explain, why an embedded system programmer should know the following? (8)
- Program and Data memory
 - Interrupts
 - Registers
 - I/O
- Q.5** a. Explain the following (8)
- Pulse width modulator (PWM)
 - UART
- b. Given a 100 MHz crystal-controlled oscillator and a 32-bit and any number of 16-bit terminal-count timers, design a real-time clock that outputs the date and time down to Milliseconds. You can ignore leap years. Draw a diagram and indicate terminal-count values for all timers. (8)
- Q.6** a. What is RAM? Draw and explain its internal structure (6)
- b. What is cache mapping? List different cache mapping techniques and explain any one technique (6)
- c. Sketch the internal design of a 4×3 ROM (4)
- Q.7** a. What are the advantages of DMA? Explain the Peripheral to memory transfer with DMA. (8)
- b. Explain the benefits that an interrupt address table has over fixed and vectored interrupt methods. (4)
- c. Explain the difference between port-based I/O and bus-based I/O. (4)
- Q.8** a. Explain Task and task states and scheduler with reference to RTOS (8)
- b. What is shared data problem? List methods to protect the shared data and compare them (8)
- Q.9** Discuss the case study of an Embedded System for an Adaptive Cruise Control System in a Car. (16)