**Code: AE68**      **Subject: EMBEDDED SYSTEMS DESIGN**

## AMIETE – ET

**Time: 3 Hours**      **JUNE 2013**      **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.**

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

     a. RS0 and RS1

       **(A)** Are not in the PSW as these are not the flags.
       **(B)** Are in the register banks.
       **(C)** Are the bits-4 and 5, respectively, for selecting the register bank in the PSW.
       **(D)** Are the bits-3 and 4, respectively, for selecting the register in bank in the PSW.

     b. EEPROM _____

       **(A)** is flash also.
       **(B)** is for erase at a time of one byte and flash for a sector of bytes.
       **(C)** is different from flash.
       **(D)** works identically for erase as well as write.

     c. A MCU must have_____

       **(A)** oscillator and reset circuits
       **(B)** oscillator, reset and watchdog timer circuits
       **(C)** oscillator circuit
       **(D)** external memory interfacing circuit

     d. NOP Instruction _____

       **(A)** is a jump to next instruction within just 1 cycle.
       **(B)** does no operation and does not change the program counter.
       **(C)** stops the clock of the CPU and does not do any operations.
       **(D)** increments the PC by 1, stops the clock of CPU and does not do any operation.

e. Real time actions are feasible _____

   (A) with a free running timer.
   (B) with a timer that can be started by another timer.
   (C) with overflow interrupts of any timer.
   (D) with the 8068 RTCI feature only.

f. A DAC output uses a low pass filter_____

   (A) for low noise filtering.
   (B) to reduce the effect of sharp 1 to 0 transition and 0 to 1 transitions at DAC Input.
   (C) to drive low frequency output.
   (D) to drive the DC motor.

g. Stepper motor moves one step angle when_____

   (A) current is transferred from one coil to the neighbouring coil.
   (B) current is switched off in the neighbouring coil.
   (C) current is switched on in the neighbouring coil.
   (D) when the current is given to all the coils.

h. Assembler directives_____

   (A) are at the operation code field.
   (B) has four fields.
   (C) are the operation code and the operand fields.
   (D) are before the start of a code block or the control structure.

i. Which of the following options is true?

   (A) A task cannot call any other function.
   (B) A function can call a task.
   (C) A task can call multiple tasks in a multitasking system.
   (D) A task can be assigned to an ISR.

j. Code optimization_____

   (A) is to reduce the code size.
   (B) is to reduce the code size or increase the code execution speed.
   (C) is to reduce the code size or to increase the code execution speed or both as per the option chosen.
   (D) is to reduce the code size or to decrease the code execution speed or both as per the option chosen.

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

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**Q.2** a. Write the benefits of choosing a single purpose processor over a general purpose processor. **(6)**

b. List the hardware units that must be present in the embedded systems. **(4)**

c. Explain the processor technology and IC Technology used for embedded system. Also give a brief description on the trade offs in Embedded System Design. **(6)**

**Q.3** a. Give a detailed description on the basic architecture of a general purpose processor. Give suitable diagrams also. **(6)**

b. Explain the following terms:-

(i) SOC
(ii) Device programmer
(iii) ASIP **(6)**

c. Explain briefly pipelining. **(4)**

**Q.4** a. Tabulate the uses of Timer device with applications and explanations. **(6)**

b. How will you set watchdog timer to restart the processor at every 2 ms? **(4)**

c. Explain the principle and working of UART with a suitable diagram. **(6)**

**Q.5** a. Explain the memory allocation schemes in an embedded system. Also give a short note on extended memory. **(6)**

b. Consider a byte - addressable computer with 16 - bit addresses a cache capable of storing a total of 4 K bytes of data and blocks of 16 bytes. Show the format (including field names and sizes) of memory address for:
(i) Direct mapped                         (ii) Fully associative
(iii) 4 - way set associative **(6)**

c. Draw the external block diagram of a ROM and describe it. **(4)**

**Q.6** a. What are the characteristics taken into consideration when interfacing a device and a port? **(6)**

b. List the features of synchronous, iso-synchronous and asynchronous serial communication? **(6)**

c. What is the advantage of Direct Memory Access? Give a diagram to explain it.**(4)**

**Q.7** a. Explain the various RTOS task scheduling models. Why is priority inversion problem? When does it occur? **(6)**

b. List the ways in which an RTOS handles the ISR in a multitasking environment.
**(6)**
c. Discuss with a diagram Task synchronization model for a specific application.**(4)**

**Q.8**   a.  Enlist the standard features of events and compare the methods of intertask communication.                                                                **(8)**

b.  Give a short note on the working of mail boxes and pipes in an embedded system.                                                                                      **(4)**

c.  What are queue related functions?                                                            **(4)**

**Q.9**   a.  Explain the need of tasks for priority and encapsulation in real-time operating system.                                                                          **(8)**

b.  What are the efficient memory management techniques for saving memory space and power?                                                                             **(8)**