CMR INSTITUTE OF TECHNOLOGY

USN | | | | | | | | | | |

Internal Assessment Test-I – Mar. 2017

Sub:	**Embedded Systems**							Code:	**10EE665**
Date:	**30/03/2017**	Duration:	**90 mins**	Max Marks:	**50**	Sem:	**VI**	Branch:	**EEE**

Note: Answer for FIFTY marks.

		Marks	OBE CO	OBE RBT
1.(a)	Define embedded systems. Explain different main components of embedded systems.	[6]	CO1	L1
1.(b)	Write a short note on SoC.	[4]	CO1	L1
2.(a)	Describe the architectural features of 6811 microcontroller with a suitable block diagram.	[10]	CO1	L2
3.	Define addressing mode. Explain with an example, various types of addressing modes of 68HC11 microcontroller.	[10]	CO1	L1

. . . .

CMR INSTITUTE OF TECHNOLOGY

USN | | | | | | | | | | |

Internal Assessment Test-I – Mar. 2017

Sub:	**Embedded Systems**							Code:	**10EE665**
Date:	**30/03/2017**	Duration:	**90 mins**	Max Marks:	**50**	Sem:	**VI**	Branch:	**EEE**

Note: Answer for FIFTY marks.

		Marks	OBE CO	OBE RBT
1.(a)	Define embedded systems. Explain different main components of embedded systems.	[6]	CO1	L1
1.(b)	Write a short note on SoC.	[4]	CO1	L1
2.	Describe the architectural features of 6811 microcontroller with a suitable block diagram.	[10]	CO1	L2
3.	Define addressing mode. Explain with an example, various types of addressing modes of 68HC11 microcontroller.	[10]	CO1	L1

		Marks	OBE	
			CO	RBT
4.	Classify the embedded systems and explain the skills required for an embedded system designer.	**[10]**	CO2	L4
5.(a)	Explain the necessity of sample and hold circuit?	**[4]**	CO3	L1
5.(b)	Explain the operation of a 3-bit DAC with R-2R ladder network with aid of neat diagram.	**[6]**	CO3	L1
6.	With a neat block diagram, explain data acquisition system for temperature measurement.	**[10]**	CO3	L1
7.(a)	Discuss the various issues for selecting a DAC.	**[4]**	CO3	L2
7.(b)	Discuss different interfacing approaches of 8-bit ADC to a microcontroller.	**[12]**	CO3	L2

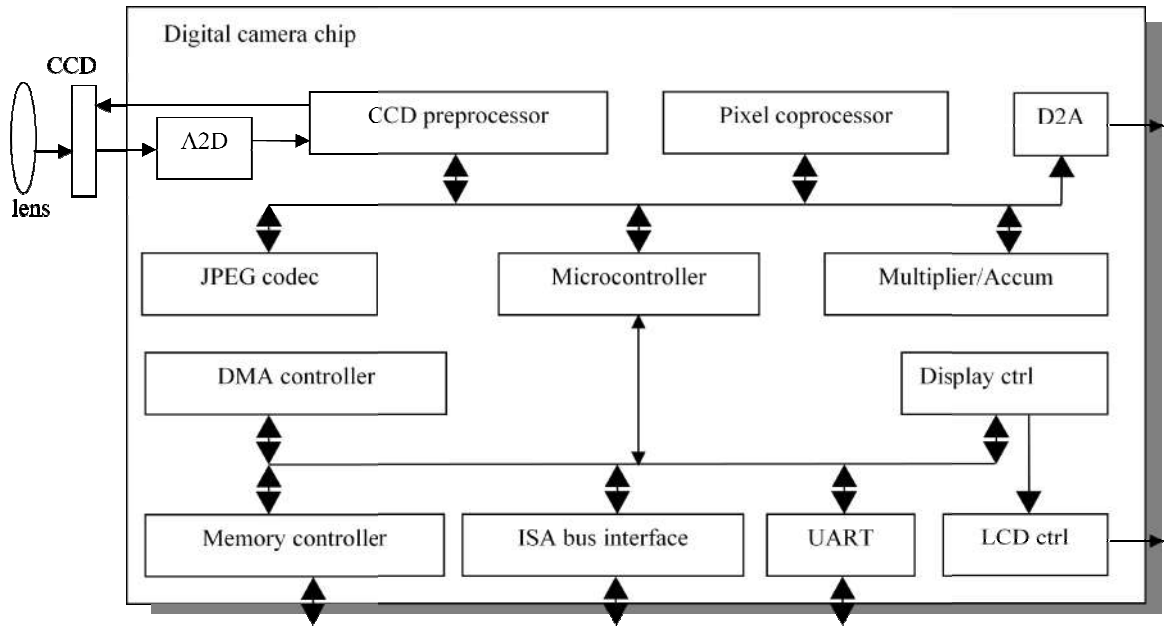
. . . .

		Marks	OBE	
			CO	RBT
4.	Classify the embedded systems and explain the skills required for an embedded system designer.	**[10]**	CO2	L4
5.(a)	Explain the necessity of sample and hold circuit?	**[4]**	CO3	L1
5.(b)	Explain the operation of a 3-bit DAC with R-2R ladder network with aid of neat diagram.	**[6]**	CO3	L1
6.	With a neat block diagram, explain data acquisition system for temperature measurement.	**[10]**	CO3	L1
7.(a)	Discuss the various issues for selecting a DAC.	**[4]**	CO3	L2
7.(b)	Discuss different interfacing approaches of 8-bit ADC to a microcontroller.	**[12]**	CO3	L2

Q1.a

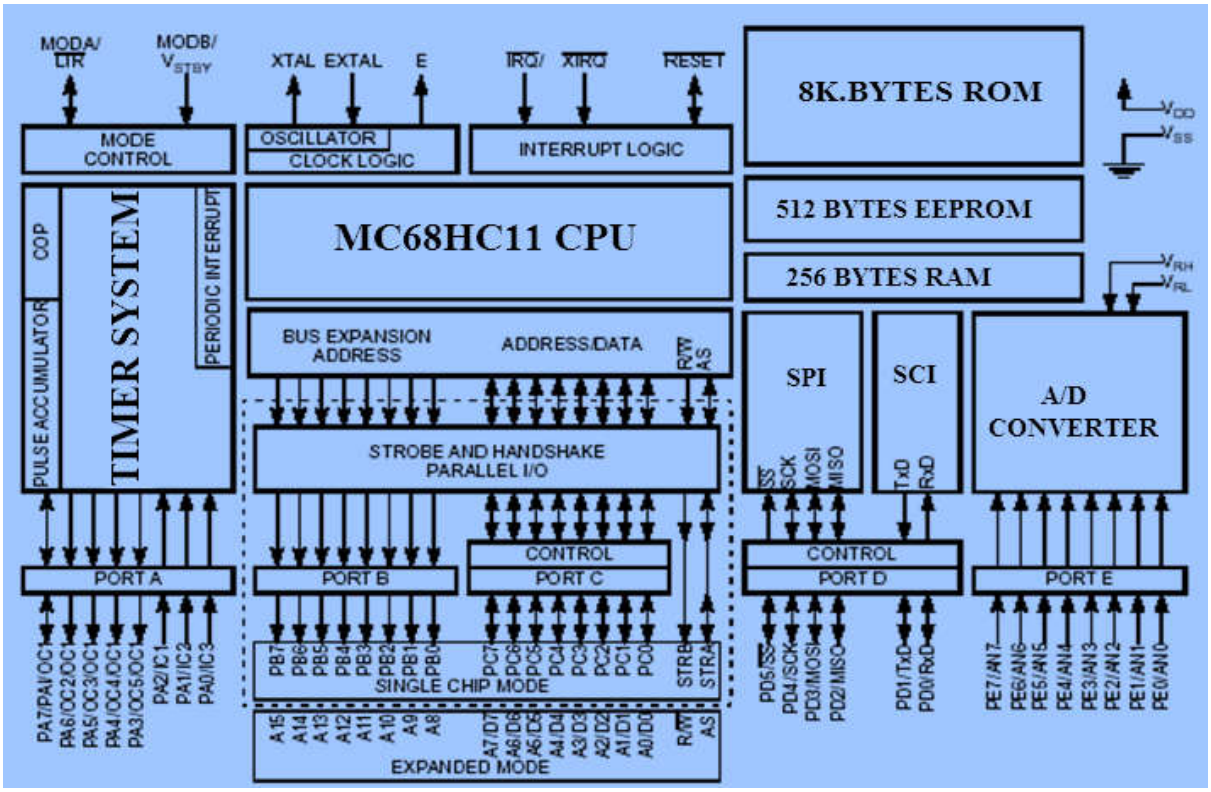
- Embedded – fixed to something
- It is a special-purpose computer system designed to control or support the operation of a larger technical system.
- Unlike a general-purpose computer, it performs a few specific, more or less complex pre-defined tasks.
- It has sensors and actuators.
    - Components:
    - Processor
    - Memory
    - System Clock
    - Power Supply and Supervisor Unit
    - Peripherals
    - Software

Q1.b



- Single-functioned -- always a digital camera
- Tightly-constrained -- Low cost, low power, small, fast
- Reactive and real-time -- only to a small extent

Q2.



- The HCMOS MC68HC11 is an advanced 8-bit MCU with numerous on-chip peripheral capabilities.
- Up to 10MIPS Throughput at 10MHz
- 256 Bytes of RAM , 512 Bytes of In-System Programmable EEPROM.
- Eight channel 8-bit Analog to Digital Convertor
- One serial peripheral interface, with a speed up to 1M (baud rate)

Q3.

1. Immediate Addressing Mode
    - Data is part of the instruction itself.
    - This mode is specified with the use of the prefix “#” before the data byte or word.
    - Example:
    - **LDAA #$80**
    - Loads the A register with the hex number $80

2. Direct Addressing Mode

- Data is located in RAM (within addresses $0000 to $00FF).
- One byte is used to specify which RAM location is to be used.
- Example:
- **STAA $80**
- Stores the A register to the memory location $0080.

3. Extended Addressing Mode
    - Location of data is specified by a 16-bit address given in the instruction.
    - Example:
        - **STAA $1000**
        - Stores the contents of the A register at memory location $1000 (hex)

4. Indexed Addressing Mode
    - Location of data is specified by the sum of a 16-bit index register (register X or Y) and an offset value that is part of the instruction.
    - Example:
    - **LDAA 5,X**
    - Loads the A register with the memory byte located at the address that is the sum of the value currently in the X register and 5 (dec).
    - Offsets range in value from 0 to 255.

5. Inherent Addressing Mode
    - Data is “inherent” to the microprocessor and does not require an external memory address.
    - Example:
        - **TAB**
        - Transfers the contents of the A register to the B register.
        - No external memory address is required.

6. Relative Addressing Mode

    - Location is specified by an offset value from the address of the instruction currently being executed.
    - Example:
        - **BRA 5**
    - Causes a branch that skips five bytes ahead in the instruction stream.
    - Relative addressing is only used in branching instructions.
    - allowing jumps both forward and backward in the instruction stream.
    - Offsets range in value from –128 to +127.

Q4.

Classification of Embedded Systems

- Small Scale Embedded Systems
  - Single 8/16 bit MC, simple hardware (using evaluation board) and software (IDE) assembly/'C' language
- Medium Scale Embedded Systems
  - Single or multi 16/32 bit MCs/DSPs/RISCs (Reduced instruction set computing), networking
  - Little more complexity in hardware and software (IDE) higher level language.
- Sophisticated Embedded Systems
  - Combination of MCs/DSPs/FPGA, networking
  - Hardware and software co-design, components that have to be integrated in the final system.

Q7

DAC Selection

- *Precision/range/resolution*
  - These three parameters affect the quality of the signal that can be generated by the system.
  - The more bits in the DAC, the finer the control the system has over the waveform it creates.
- *Channels*
  - Even though multiple channels could be implemented using multiple DAC chips, it is usually more efficient to design a multiple-channel system using a multiple-channel DAC.

DAC Selection

- *Configuration*
  - DACs can have voltage or current outputs.
  - Current-output DACs can be used in a wide spectrum of applications (adding gain and filtering) but do require external components.
  - DACs can have internal or external references.
  - External-reference DAC can be used often in variable-gain applications (multiplying DAC).

DAC Selection

- *Speed*
  - Dynamic behavior of the DAC – settling time, maximum output rate
  - Gain/BW product of the analog amplifier.
  - The speed of the DAC together with the speed of the PC/software will determine the effective frequency components in the generated waveforms.

DAC Selection

- *Power*
  - The type of power required. (voltage levels)
  - The amount of power required.
  - The need for a low-power sleep mode. Shutdown command to the DAC.
- *Interface*
- *Package*