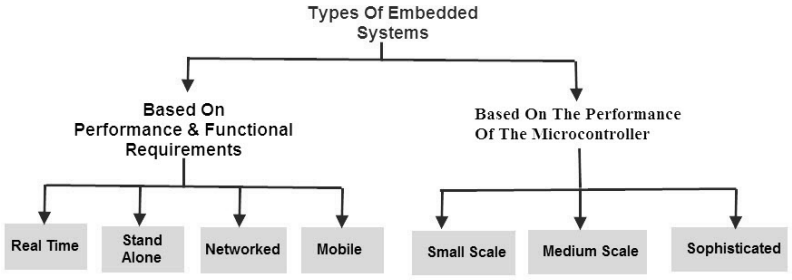
KONERU LAKSHMAIAH EDUCATION FOUNDATION
(Deemed to be University, Estd. u/s. 3 of UGC Act 1956)

Even Semester, 2018-19
Sem-In Examinations-I (TEST-1), Feb 2019
B. Tech. (ECE), 2015 Batch
IV/IV, 8th Semester
15EC3103: Embedded Systems and Applications
Answer Key

1. Classification of embedded system applications with examples. (5M)

Embedded system introduction and how the applications are Classified **(1M)**



i) Embedded Systems are classified into three types based on the performance of the microcontroller such as

Small scale embedded systems
Medium scale embedded systems
Sophisticated embedded systems
(or)

ii) Embedded systems are classified into four categories based on their performance and functional requirements:

Stand alone embedded systems
Real time embedded systems
Networked embedded systems
Mobile embedded systems
(or)

iii) Embedded systems are classified into five categories based on application domains

Embedded Systems in Automobiles and in telecommunications
Embedded Systems in Peripherals & Computer Networking
Embedded Systems in Consumer Electronics
Embedded Systems in Biomedical
Embedded Systems in Agricultural and etc.

For any one classification (**2M)** and for Examples (min 2-3) each (**2M)**

2. Explain the various Analog to Digital converters and how it is working in temperature measurement system. (5M)

Analog-Digital converters: **(1M)**

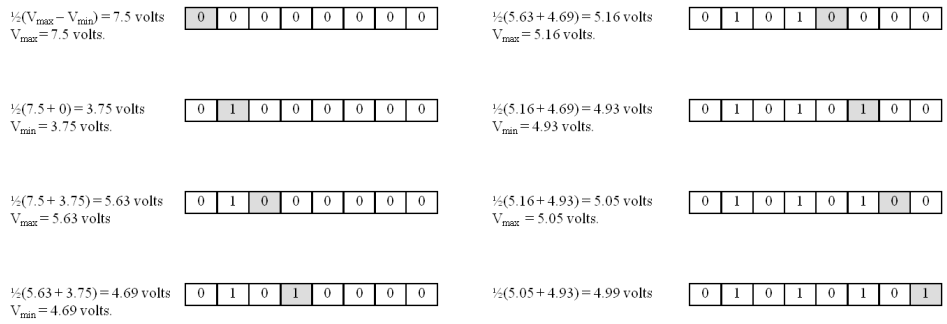
An Analog-Digital Converter (ADC) is a widely used electronic component that converts an analog electric signal (usually a voltage) into a digital representation

Types of Analog to Digital Converters **(1M+ in Detail 1M)**

- Dual Slope A/D Converter
- Flash A/D Converter
- Successive Approximation A/D Converter
- ADC comparison
- Sample and hold

Temperature measurement system details/Block diagram and interpret A/D with any one types like this method: **(2M/3M)**

Successive-approximation method

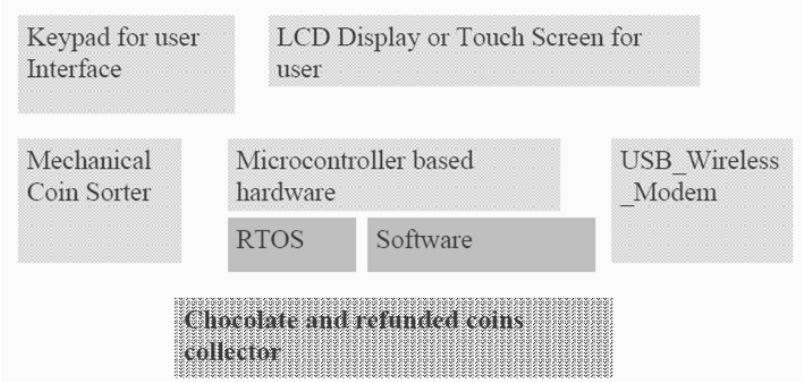


3. Choose the appropriate processor for chocolate vending machine and also Identify the required input and output components for vending machine. (5M)

Processor Selection: Microcontroller/ASIP (Application Specific Instruction Set Processor) **(1M)**

Justification of this answer with valid reason **(1M)**

Block diagram/ Pictorial representation of CVM **(1M)**

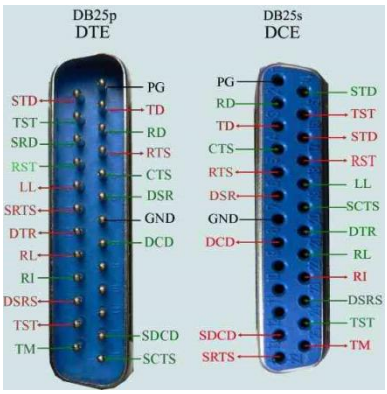


Detail explanation of each blocks **(2M)**

4. Explain serial communication using RS232 and CAN (5M).

RS232 **(2.5M)**

- The RS-232C standard is an ***asynchronous serial*** communication method.
- Serial means that the information is sent 1-bit at a time.
- The RS-232C standard works at the ***physical layer*** of the communication standard. This is the lowest level and the one that physically connects the devices.
- The communication is done through the ***serial port*** of the PC. This is a male connector with 25 (old) or 9 (new) pins, in both cases only 9 pins, at the most, are used.
- A ***DTE*** (Data Terminal Device) is usually a computer.
- A ***DCE*** (Data Communication Device) is usually a Modem. A Cable connecting 2 PCs is also a Modem. It is called a ***NULL Modem***.
- The DTE to DCE speed is also called the line speed.
- Maximum Modem speed today is 56K BPS (56K Bits Per Second), this is the line speed. On the other hand the maximum DTE/DCE speed is 115,200 BPS. This is the gap software must bridge.



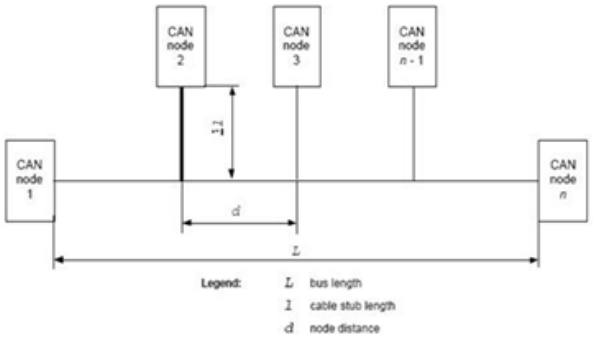
1Mark for Diagram and 1.5M Marks for explanation.

CAN: **(2.5M)**

- CAN (Controller area network)
  - Protocol for real-time applications
  - Developed by Robert Bosch
  - Originally for communication among components of cars
  - Applications now using CAN include:
    - elevator controllers, telescopes, production-line control systems, and medical instruments
  - Data transfer rates up to 1 Mbit/s and 11-bit addressing
  - Common devices interfacing with CAN:
    - 8051-compatible 8592 processor and standalone CAN controllers
  - Actual physical design of CAN bus not specified in protocol

- Requires devices to transmit/detect dominant and recessive signals to/from bus
- e.g., '1' = dominant, '0' = recessive if single data wire used

Bus guarantees dominant signal prevails over recessive signal if asserted simultaneously



1Mark for Diagram and 1.5 Marks for explanation.

5. Interpret the working principle of major sensors used in food industry (5M).

ANS:

The major sensors used in Food Industry are: (0.5M)

1. IR Sensors

2. Optical Sensors

3. Ultrasound Sensor

Optical sensors: (1.5M)

Light emitting diodes monitor changes in optical parameters at the biological level.

The photodiode will give different voltage levels, relative to the absorbance levels of a specific enzyme, which reflect the concentration of the enzyme in the measure and Fiber optic technology can be used to devise reflectance, transmittance or fluorescence based biosensors by immobilization of reactive chemicals at the terminal of a small fiber optic probe (17). pH changes have been monitored optoelectronic ally by using pH sensitive dyes immobilized on a fiber optic/photodiode combination.

Ultrasonic sensors: (1.5M)

work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

Infrared sensor (**1.5M)**

emits and/or **detects infrared** radiation to sense its surroundings. ... The basic concept of an **Infrared Sensor** which is used as**Obstacle detector** is to transmit an **infrared** signal, this **infrared** signal bounces from the surface of an object and the signal is received at the **infrared** receiver.

Explanation of 3 sensors, each sensor carries 1.5 mark.

6. Compare the interrupt driven I/O by fixed ISR location and vectored interrupt. (5M)

ANS:

- Compromise between fixed and vectored interrupts ()
  - One interrupt pin
  - Table in memory holding ISR addresses (maybe 256 words)
  - Peripheral doesn't provide ISR address, but rather index into table
    - Fewer bits are sent by the peripheral
    - Can move ISR location without changing peripheral

1Mark

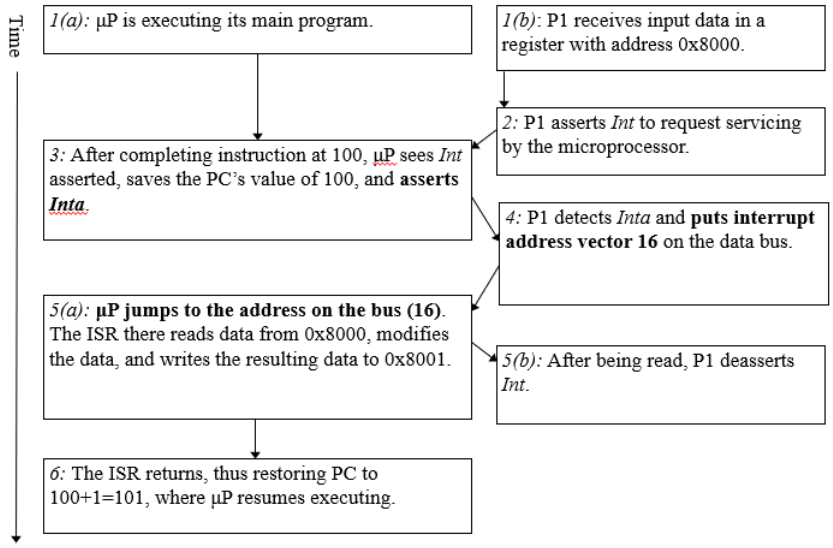


Fig: Interrupt-driven I/O using vectored interrupt

2M

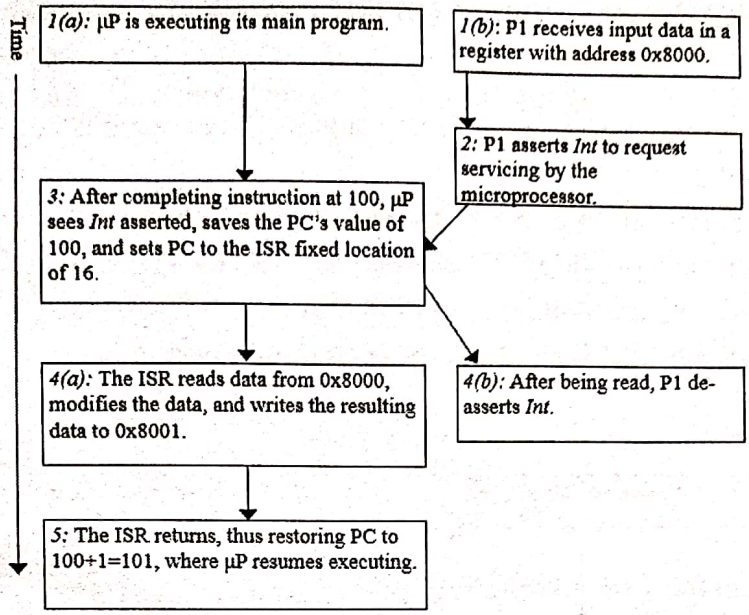


Fig: Interrupt-driven I/O using fixed ISR location
2M

Compare with Flow diagram.

Course Coordinators
(Dr. S. Arunmetha)

HOD

Deputy HOD
Department of ECE
K L E F
Green Fields, Vaddeswaram,
Guntur Dist.A.P, PIN-522 502