BE1-R4: EMBEDDED SYSTEMS

NOTE:

1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours **Total Marks: 100**

1.

a) State the important features of the RTOS in embedded systems.

b) Explain following terms, which are commonly used in applications of interrupt driven embedded systems.
   i) ROM emulator
   ii) Logic Analyzer

c) Give distinct comparisons between Spiral Model and Waterfall Model, which are mainly used in programming of embedded system.

d) Enumerate the similarities and differences between the 8-bit microcontroller and 16-bit microcontroller.

e) Any embedded system is differentiated using hard or soft or firm real-time systems based on its priority tasks defined. State differences between each type of real-time system.

f) Differentiate between Von-Neuman Architecture and Harvard Architecture.

g) Briefly write about following memory types, commonly make the embedded system essentials.
   i) UVROM
   ii) DRAM
   iii) Flash memory
   iv) Hybrid memory

(7x4)

2.

a) Explain interrupt operation in clock-driven scheduler and compare with event-driven and hybrid type real-time scheduling algorithms.

b) Compare: VLIW architecture Versus Superscalar architecture. Briefly explain the pipeline operation in processors technology for enhancing the performance.

(9+9)

3.

a) Write features and applications of interfacing protocols, FIREWIRE and USB.

b) How does the watchdog timer (WDT) device useful in any digital system operated with any standard microprocessor?

c) Explain the significance of priority-based preemptive scheduler in the synchronized inter-process communication of embedded system.

(6+6+6)

4.

a) In real-time operating system, cooperative scheduling algorithm is closely related to function queue scheduling. Most common scheduling technique is cooperative round robin scheduling. Explain its operational feature with a simple block-diagram. State advantage and disadvantage of this type of scheduling method.

b) Explain the operation of LIN (Local Interconnect Network). How does it transmit and receive the data? Also, give differences between LIN and CAN (Controller Area Network).

(9+9)

5.

a) Explain how the remote debugger overcomes the limitation of embedded platforms resources. Also, draw the typical block diagram of an embedded debugger.

b) Explain the most fundamental debugging technique, debug kernel with schematic representation. Then, summarize the advantages and disadvantages of the debug kernel.

c) With respect to embedded system design methodology, write the basic differences between static modeling and dynamic modeling?

(6+6+6)

6.

a) Explain architecture of 8-Bit microcontroller.

b) Design a simple embedded application to detect a switch input and same time the key status is reflected on screen. For example, RISC 8051 microcontroller is given, a push-button key is interfaced with Port 1, pin#0 and Port 3 is connected with display module. Use high-level language like C or OOPS.

(8+10)

7. Write detailed notes on **any three** of the following:

a) DMA controller

b) UART (Universal Asynchronous Receiver Transmitter)

c) Bluetooth technology

d) Voice over IP

(6+6+6)