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) What is an embedded system? Which are the essential structural units of embedded system hardware? List each of them.

b) Explain, "System on chip (SoC)". Which are the components being embedded in a SoC?

c) Explain the term "Task". Which are the states of the task? Explain functions of each of the states.

d) Which are the methods used by J2ME (Java 2 Micro Edition) for reducing the code size in the applications like smart card?

e) What was the necessity of Controller Area Network (CAN) for implementing a real-time communication? Draw a figure of an architecture of CAN Controller.

f) Define context, interrupt latency and interrupt service deadline for Interrupt Service Mechanism.

g) Enlist the designs or processes, where UML is used? Which are the modeling diagrams used in UML?

(7x4)

2.

a) What is the necessity of a Watchdog timer in a microcontroller? Give typical applications of a Watchdog timer.

b) For the following C statements write ARM assembly code for ARM processor

```
if ( a>b)
{
      x=10;
      y=c+d;
}
else
      x=c□d;
```

c) Explain instruction flow in a pipeline of a processor.

(6+6+6)

3.

a) Explain three ways in which an RTOS handles the ISRs in a Multitasking environment.

b) Compare two scheduling strategies for the real time scheduling in preemptive mode and round robin scheduling for RTOS.

c) Discuss basic features of RTOS VxWorks which are essential in a sophisticated embedded system design.

(6+6+6)

4.

a) Discuss the design cycle of Embedded System.

b) Explain architecture of VLIW.

c) DMA (Direct Memory Access) helps in reducing the processor load by providing direct access for the IOs. What are the advantages of DMA based data transfer over the interrupt driven data transfer? How does it help in faster task execution in multi-tasking system by the reduced interrupt service latencies?

(4+7+7)

5.

a) What are the disadvantages of C++ language used in embedded programming? How code size can be reduced by optimizing the generated codes?

b) Draw a figure of a processor of embedded system which is connected to system memory bus and networks to other systems through a serial bus. Give a few names of particular serial buses.

c) Explain Harvard Architecture and Von-Neumann Architecture with diagram.

(6+6+6)

6.

a) Differentiate between CISC and RISC.

b) Explain the concepts of OOPS and describe the way, it is beneficial in programming of embedded systems.

c) "The Zigbee network is self-organizing and supports peer to peer and mesh networks" Prove the statement by taking a suitable example.

(6+6+6)

7.

a) What is a Logic Analyzer? Draw the architecture diagram of the Logic Analyzer.

b) Describe important features of Java, which makes it a highly useful high-level language for an embedded system in many network related applications.

c) Embedded Systems locate a software image in ROM. What does the image consist of?

(7+7+4)