Sem-VIII / Rev. / ETRX

14-p3-upq-Con No. File

Con. 3217-10. **(REVISED COURSE)** **AN–3136**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** from remaining **six** questions.

Embedded Systems & Real-Time Programming

Q.1 a) Design an embedded system to measure frequency of a power line. The system is expected to measure frequency correctly up tone decimal place and ring an alarm if it is less than 47 Hz or greater than 53 Hz. Suggest hardware components used with justification. 12

b) Explain the use of following in Embedded C Programming 08
include directive and header files
define
static and volatile modifiers

Q.2 A simple battery operated toy is to be developed for alphabet learning. The specifications are as follows 20

- There are keys for alphabets and to choose level of learning.
- For any alphabet key pressed a prerecorded message is played and a display indicates the alphabet.
- For different levels different messages should be played.(Satisfying learner at different level)
- If more than two keys are pressed error message is to be played.

Design a system indicating components required.
Explain the design with choice of processor.
Show how audio message is generated.

Q.3 a) A real time program has three tasks with following characteristics 10

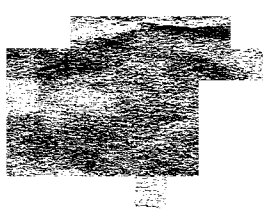
	Period	execution time	Initial occurrence at
T1	3	1	0
T2	6	2	2
T3	12	3	5

In addition to that there is aperiodic task T4 which occurs at time = 11 and takes 5 units of time for execution.
If the priorities are assigned according to their periods / deadlines dynamically and preemptive scheduling is done then evaluate whether all the tasks meet their deadlines. Also find waiting time for T4

b) Explain reentrancy and disabling of interrupts method to avoid shared data problem with suitable example. 10

Q. 4 a) One task is generating data to be sent to another task and the second task is using this data for further processing. Explain which Inter task communication tools will be used to synchronize these tasks so that none has to wait for the data and no data should be overwritten or lost. 10

b) Write a short note on Interrupt Latency and its role in design of embedded real time systems. 10



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Q.5 a) Write an assembly language program for following code in C for 8 bit processor / microcontroller (Assume instruction set) 10

```
#define Input_A P0
#define Input_B P1
main( )
{
int  m, n , total ;
while ( 1)
{
if (total = 0) break;
if (m<n)
{
total = m + n;
}
m = Input_A;
n= Input_B;
}
}
```

Q. 5 b) Explain need of corrective protocols in case of unbounded priority inversions. 10
Explain with suitable examples when to use Priority inheritance protocol and when to use priority ceiling protocol.

Q. 6 a) Discuss layered architecture of CAN node. Elaborate Transfer Layer with regards to message framing and arbitration. 06

b) What is the role of processor reset and system reset? 06
Explain need of watchdog timer and reset after the watched time.

c) Explain what Build Process of Embedded Software is. 08

Q.7 Write short notes on **any 3** 20

1) RISC and CISC processors
2) In Circuit Emulators
3) Use of I^2C Embedded Systems
4) waterfall model of embedded software development
5) Black Box Testing