

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E Sem-I Regular Examination January / February 2011****Subject code: 710409N****Subject Name: Embedded System Design****Date: 03 /02 /2011****Time: 02.30 pm – 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Answer following questions from the point of view of ARM microcontroller LPC2148. **07**
- 1) What is the use of Pin Connect Block?
 - 2) Explain the use of Prescaler register in timers.
 - 3) What is the burst mode of operation in ADC?
 - 4) How the address of interrupt service routine is pointed in vectored interrupt?
 - 5) What is the limitation associated with the frequency of operation for Capture pins?
 - 6) Mention the peripherals connected with Advance High-performance Bus.
 - 7) What is the use of Phase Locked Loop?
- (b)** An automatic coffee making machine is having two keys defined as start and emergency stop. The tank is equipped with two limit switches to identify the water tank full and water tank empty condition. The tank contains an on/off control valve for powder mixed water inlet, a temperature sensor LM35 to monitor the temperature of powder mixed water, a heater to heat powder mixed water, a motor (running at single speed with on/off control) attached with stir to mix the water and an on/off control valve for carrying coffee outside the tank. Show the brief interfacing utilizing LPC2148 to implement above system. Draw flow chart along with the use of specific registers of LPC2148 to implement following task. **07**
- Fill the water tank with water having powder mixture, following the signals generated by limit switches.
- (i) If temperature of the tank $< 70^{\circ}\text{C}$, turn on the heater until temperature of the tank is 72°C .
 - (ii) When Start button is pressed, stir the water for 4 seconds and ON the outlet valve for 7 seconds.
 - (iii) Emergency button is interfaced for Fast Interrupt Request. When this button is pressed, all activation controls are made OFF and system is reset.
- Q.2 (a)** 1) Explain all kinds of memories in an embedded system design with their merits and demerits. **04**
- 2) Explain Dynamic Random Access Memory unit with refresh logic. **03**
- (b)** A pressure sensor giving 40mV dc differential output for the 100mmHg full scale pressure measurement is to be interfaced with LPC2148. Design the signal conditioning circuit to read full scale measurement. Display the pressure in “xx.yy” form using multiplexed seven segments LED display to display the same in the range of 0 to 99 mmHg. Draw the interfacing of this system. Write algorithmic steps along with the use of registers to implement this task. Assume PCLK as 1 MHz. **07**

OR

- (b) It is desired to measure the frequency of pulses in the range of 0 Hz to 150 KHz, given at CAP0.0 pin of LPC2148. The measured frequency is to be displayed in terms of KHz on seven segment multiplexed LED display field as “xxx.y” KHz. Show the interfacing and write down algorithmic steps along with use of registers involved for this task. Assume PCLK as 1 MHz. **07**
- Q.3** (a) 1) Explain layered software to improve the quality of the software for embedded system design? Mention the use of Gate in this regard. **04**
 2) What is the use of Watchdog timer in embedded system design? Explain the use of specific registers for handling Watchdog timer functions. **03**
- (b) How compilers with the support of higher level language improves the software development in embedded systems. Mention the specific advantages associated with lower level language programming. **07**
- OR**
- Q.3** (a) 1) What is heap memory? How it can be used in the software? Mention the advantages of the heap memory. **04**
 2) Explain the use of required registers for setting the baud rate for UART in LPC2148. **03**
- (b) 1) How non vectored Interrupts are served in LPC2148? **04**
 2) Explain power down mode features of LPC2148. **03**
- Q.4** (a) Explain in detail the scheduling mechanisms in the implementation of Real Time Operating System (RTOS). **07**
- (b) 1) Explain the advantages associated with an application developed with RTOS. **04**
 2) How software abstraction improves the quality of the software? Explain with an example. **03**
- OR**
- Q.4** (a) Explain process starvation and priority inversion with possible solutions in RTOS? **07**
- (b) 1) Explain the methods of inter task communications in RTOS. **04**
 2) How Semaphore is used to protect the shared resources? Explain with an example. **03**
- Q.5** (a) Explain features of Serial Peripheral Interface (SPI) bus protocol and compare the same with Inter-Integrated circuit (I²C) bus protocol. **07**
- (b) Briefly explain the USB device descriptors. **07**
- OR**
- Q.5** (a) Explain the features of I²C serial data transfer protocol and mention its applications in the field of Embedded Systems design. **07**
- (b) Explain the features associated with an endpoint in a USB device characterized by control transfer type. **07**
