INDIAN INSTITUTE OF TECHNOLOGY

DATE: **FN/AN** **Time: 2 Hrs** **Full Marks:50** **No. of students:**

Spring Semester, 2011 Deptt: Electronics & Elec. Comm. Engg. **Sub. No.: EC31006**

3rd Year B.Tech(H) **Sub. Name: Microcontroller and Embedded Systems**

Instruction: Attempt all questions.

Q1. Consider a CPU with 16-bit address bus and 16-bit data bus. Design a memory system interface to connect 4K byte ROM and 12 K byte RAM space to the processor. Each memory access gets two bytes of data as the data bus is 16-bit wide. The ROM should start from address 0000H, while the RAM should start from address 8000H. Available ROM chips are 4K x 8-bits and RAM chips are 4K x 4-bits. List the folded address spaces. [15 marks]

Q2. Design a 4-bit ALU capable of performing ADD, SUB, NAND, LT (Less than), GT (Greater than) , EQ (Equal) operations. It has two 4-bit 2's complement inputs A and B. Outputs are DATA (4-bit), Carry (1-bit), LESS, GREATER, EQUAL (each of 1-bit). [15]

Q3. Write a program in 8051 assembly language to find the number of even numbers in an array of 15 bytes stored from memory location 6000H. You program should reside from location 3000H. A separate subprogram be used to check whether a particular number is even or not. [10 marks]

Q4. Two strings are stored one after another starting from external memory location 6000H. Each string is terminated by a NULL character (an all-zero byte). Write a subprogram to compare the two strings. The function should behave similar to the library function *strcmp* in C-language. The main program should store the result of comparison in R0. [10 marks]