Dept. of E & ECE

End-Semester Examination

Time: 3 hrs Full Marks: 50

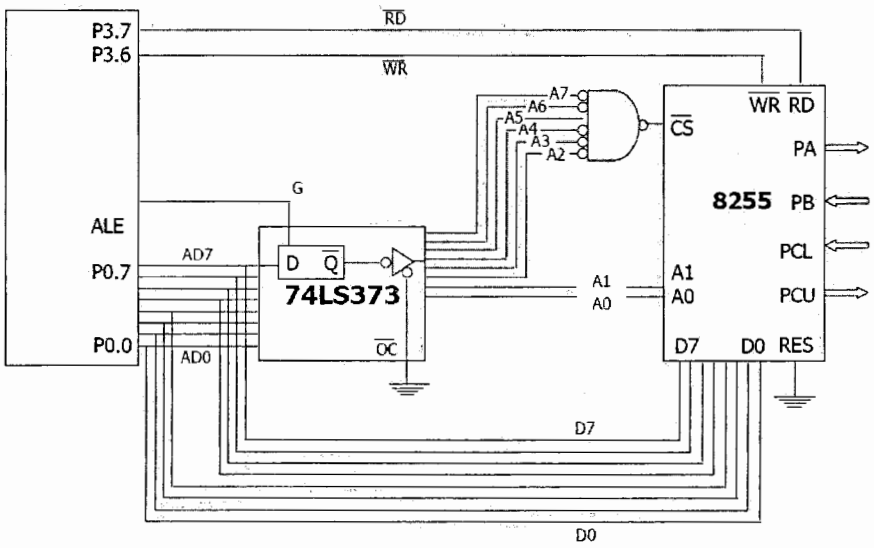
EC 31006 MICROCONTROLLER & EMBEDDED SYSTEMS

Figures in the right hand margin indicate marks.

Q1. (a) Write a program in assembly language of 8051 that checks the content of port P0. If the number read is equal to 20H, it sends FFH to port P0. If it is equal to 30H, 40H, or 50H, it sends FFH to port P1, P2, or P3 respectively. (3+3)

(b) Write a program in 8051 assembly language to find the LCM of two numbers stored at external memory locations 6000H and 6001H, with the smaller one in 6000H. Use the stack to hold the LCM.

Q2. The following figure shows the interconnection of an 8255 PPI to the 8051 microcontroller. (1+1+3)



(a) Find the I/O port addresses assigned to ports A, B, C, and the control register.
(b) Find the control byte for PA = output, PB = input, PC0 – PC3 = input, and PC4 – PC7 =output
(c) Write a program to get data from PB and send it to PA and send data from PCL to PCU.

Q3. Answer the following questions regarding the interrupt structure and processing of 8051. (5)

(i) What are the advantages of using interrupts to serve an external device?
(ii) Why are the interrupts in 8051 known as vectored interrupts?
(iii) How many interrupts are available in 8051 and what for each of these is used?
(iv) Although only 8 bytes are reserved for each of the interrupts in the interrupt vector table, 8051 can execute ISRs that consume more than 8 bytes. Explain how this is possible.
(v) The following figure shows the various fields in the interrupt enable register in 8051. Explain the significance of each field.

EA	--	ET2	ES	ET1	EX1	ET0	EX0

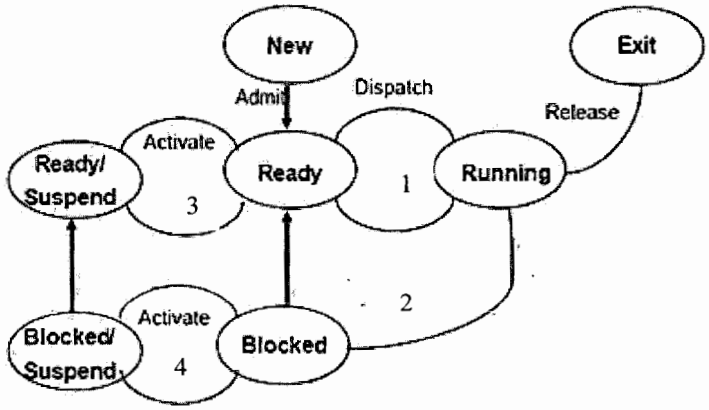
(PTO)

Q4. Explain the function of the each of the following registers in 8051: (3+2+3)
(i) Timer 0/1 register (ii) TMOD register (iii) TCON register.

Explain the operation of the timers in mode 2, that is, in auto-reload mode. Write an 8051 C program to toggle only pin P1.5 continuously every 250 ms. Use Timer 0, mode 2 to create the delay. Assume a crystal frequency of 11.0592 MHz.

Q5 What are the data types available in ARM? (1+1+
How does the Little Endian type of storage differ from the Big Endian type of storage? Suppose that the number 0x12345678 is stored at memory location 1000 in Big Endian format. If the processor now assumes the data to be in Little Endian format, what will it get if it reads (i) a byte, (ii) a half-word, (iii) a word, from the location 1000? Now if the data bus lines are connected to memory in reverse order, that is, bit-0 of data bus is connected to data line 31 of memory, 1 to 30, and so on, what values will be read in the three cases. (2+4)

Q6. The following figure gives the state transition diagram of a process.



Explain when a process enters each of the states. Give the condition for each of the transitions: 1, 2, 3, and 4.

Q7. Real-time systems can be classified as: Hard real-time systems, Firm real time systems, and Soft real time systems. Give the characteristics of each of these and give at least two example systems belonging to each class. (6)

Q8. Assume that you have to schedule a set of tasks T={T1, T2, ..., Tn} having periods p={p1, p2, ...,pn} using Table-driven scheduling. In this context, what do you mean by 'major cycle' of the task set? Prove that the major cycle is equal to LCM({p1, p2, ...,pn}) even when the tasks have arbitrary phases. (1+5)

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