Microprocessor Systems

4th May, 2004

Final Exam

1- A keypad, having 16keys (k0..k15) and an LED, is connected to a microcontroller from 8x51 family as shown in the below figure

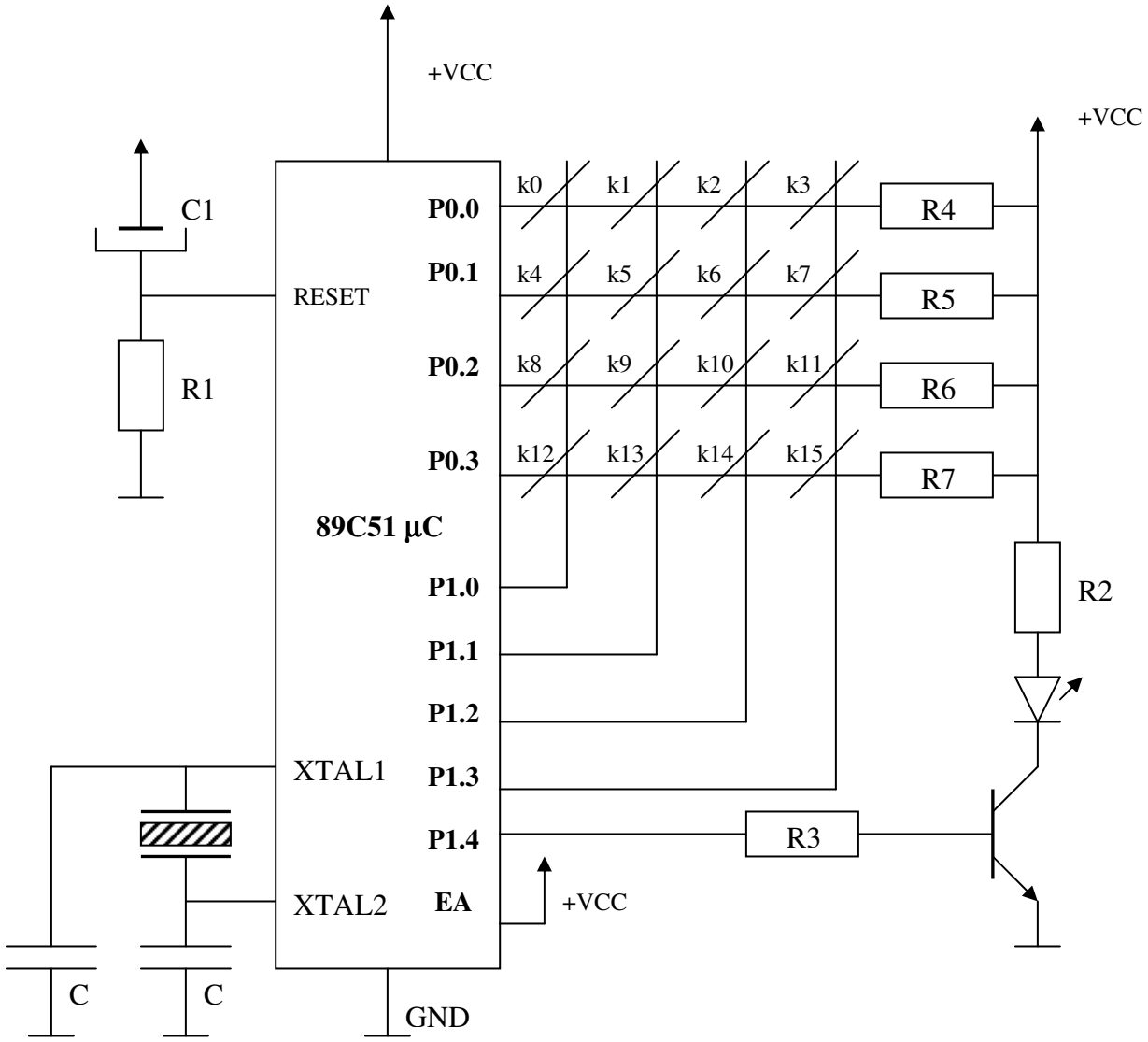
a) Write a subroutine that checks if one ore more of the keys are pressed and switches on the LED as long as the key(s) are kept pressed.

b) Write a subroutine that returns the number of pressed key inside Accumulator (A) (FF will be returned in A if there is not a pressed key)

c) Calculate the resistor values R2 and R3.

LED : I_{AC}=10mA, V_{AC}=1.2V, NPN transistor : hFE=400, V_{BE}=0.7, V_{CEsat}=0.5V

Relay : $I_R \cong$100mA @ 5V Microcontroller : V_{Lmax}=0.5V, V_{Hmin}=4.5V



3- An 8 bit CPU having 64KBytes addressing capability will be connected to a memory block containing 1 piece of 27C256 EPROM, 1 piece of 62C64 static RAM, 1 piece of 28C64 EEPROM , 1 piece of 74HC573 (8 bits single directional latch) and an address decoder unit. 4 relays and 4 LEDs will be driven through the outputs of the 74HC573. LEDs will directly be sunk by 4 output pins of 74HC573 via resistors. Relay will be driven through an NPN transistor. Reset vector assigns ProgramCounter=0000H.

a) Draw the memory-addressing map of the described system and related logical chip selection table for the decoder.
b) Draw the circuit schema of the system using 74HC138 as the decoder IC. (Value of the components may not be calculated)
c) Components' electrical parameters are given as,
LED : I_{AC}=5mA, V_{AC}=1.2V
NPN transistor : hFE=400, V_{BE}=0.7, V_{CEsat}=0.2V
Relay : $I_R \cong$100mA @ 5V
74HC573 : V_{Lmax}=0.5V, V_{Hmin}=4.5V

Calculate required resistor values for driving LED and the relay.

Duration : 100minutes 1- a)13P b)22P c)15P 2-a)15P b)25 c)10P
Suggested Timing 1-a) 10m b)25m c)10m 2- a) 10m b) 25m c)10m +10min. bonus