

1. Explain briefly the following terms: (10%)
 - (a) ASIC, (b) Harvard architecture, (c) vertical microprogram, (d) vector computer, (e) privileged instruction.
2. Use the Quine-McCluskey method to find the simplest SOP solution for the following expression: (8%)
$$T = f(a,b,c,d,e) = \sum m(0,4,8,10,13,15,16,18,22,24,31)$$
$$D = \sum m(2,6,20,26,29). \text{ (D: don't care)}$$
3. A 7-segment display is to be used with an BCD counter (e.g., 8421) and decoder designed to display the numerals 0 to 9. Design the decoder logic using
 - (a) random logic approach, (8%)
 - (b) 8-to-1 multiplexers and inverters only. (8%)
4. A clocked sequential circuit is required to detect the occurrence of either zero (000) or three (011) in 3-bits words appearing in serial form on an input line W. Note that word 1 = bits 1,2,3, word 2 = bits 4,5,6, etc., in time sequence on W. Also note that words appear LSB first, MSB last. Design this sequential circuit using JK FFs. (15%)
5. (a) What is autoindexing addressing mode? (5%)
(b) What is index scaling addressing mode? (5%)
6. Explain the two basic write policies of cache. (7%)
7. (a) Explain the difference between real mode and protection mode of Intel 80386 microprocessor. (6%)
(b) Describe the memory management mechanism of protection mode in Intel 80386 microprocessor. (7%)
8. Describe the basic interrupt mechanism of Intel 80x86 series microprocessors. (8%)
9. (a) Describe the basic operation of a DMA controller. (6%)
(b) In IBM PC/AT, what functions are executed by using DMA scheme? (7%)