7-1. What is the difference between a microprocessor and a microprogram? Is it possible to design a microprocessor without a microprogram? Are all microprogrammed computers also microprocessors?

7-1

A microprocessor is a small size CPU (computer on a chip)
Microprogram is a program for a sequence of microoperations.
The control unit of a microprocessor can be hardwired or microprogrammed, depending on the specific design.
A microprogrammed computer does not have to be a microprocessor.

7-2. Explain the difference between hardwired control and microprogrammed control. Is it possible to have a hardwired control associated with a control memory?

7-2

Hardwired control, by definition, does not contain a control memory.

7-5. The system shown in Fig. 7-2 uses a control memory of 1024 words of 32 bits each. The microinstruction has three fields as shown in the diagram. The microoperations field has 16 bits.

a. How many bits are there in the branch address field and the select field?

b. If there are 16 status bits in the system, how many bits of the branch logic are used to select a status bit?

c. How many bits are left to select an input for the multiplexers?

7-5 Control memory $= 2^{10} \times 32$

(a)

6	10	16	= 32 bits
Select	Address	Microoperations	

(b) 4 bits

(c) 2 bits

7-6. The control memory in Fig. 7-2 has 4096 words of 24 bits each.

a. How many bits are there in the control address register?

b. How many bits are there in each of the four inputs shown going into the multiplexers?

c. What are the number of inputs in each multiplexer and how many multiplexers are needed?

7-6 Control memory $= 2^{12} \times 24$

(a) 12 bits

(b) 12 bits

(c) 12 multiplexers, each of size 4-to-1 line.

7-7. Using the mapping procedure described in Fig. 7-3, give the first microinstruction address for the following operation code: (a) 0010; (b) 1011; (c) 1111.

7-7

(a) 0001000 = 8

(b) 0101100 = 44

(c) 0111100 = 60

7-8. Formulate a mapping procedure that provides eight consecutive microinstructions for each routine. The operation code has six bits and the control memory has 2048 words.

7-8

op code = 6 bits
control memory address = 11 bits