

- 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.

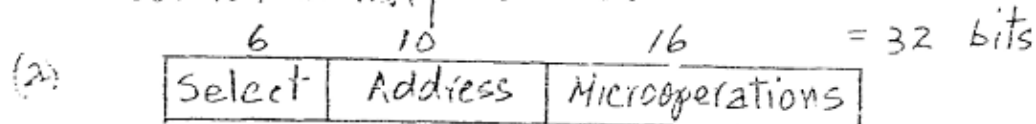
- 7-2. Explain the difference between hardwired control and microprogrammed control. Is it possible to have a hardwired control associated with a control memory?

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.
- How many bits are there in the branch address field and the select field?
 - If there are 16 status bits in the system, how many bits of the branch logic are used to select a status bit?
 - How many bits are left to select an input for the multiplexers?

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



(b) 4 bits

(c) 2 bits

- 7-6. The control memory in Fig. 7-2 has 4096 words of 24 bits each.
- How many bits are there in the control address register?
 - How many bits are there in each of the four inputs shown going into the multiplexers?
 - 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

00 | xxxxxx | 000