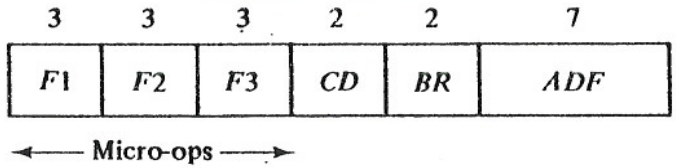

(a) Microinstruction format (20 bits):

F1	Micro-operation	Symbol
000	None	NOP
001	$AC \leftarrow AC + MBR$	ADD
010	$AC \leftarrow 0$	CLRAC
011	$AC \leftarrow AC + 1$	INCAC
100	$AC \leftarrow MBR$	BRTAC
101	$MAR \leftarrow MBR\ (AD)$	BRTAR
110	$MAR \leftarrow PC$	PCTAR
111	$M \leftarrow MBR$	WRITE

F2	Micro-operation	Symbol
000	None	NOP
001	$AC \leftarrow AC - MBR$	SUB
010	$AC \leftarrow AC \vee MBR$	OR
011	$AC \leftarrow AC \wedge MBR$	AND
100	$MBR \leftarrow M$	READ
101	$MBR \leftarrow AC$	ACTBR
110	$MBR \leftarrow MBR + 1$	INCBR
111	$MBR\ (AD) \leftarrow PC$	PCTBR

F3	Micro-operation	Symbol
000	None	NOP
001	$AC \leftarrow AC \oplus MBR$	XOR
010	$AC \leftarrow \overline{AC}$	COM
011	shl AC	SHL
100	shr AC	SHR
101	$PC \leftarrow PC + 1$	INCPC
110	$PC \leftarrow MBR\ (AD)$	BRTPC
111	Reserved	–

(b) Micro-operation fields bit assignment:

CD	Condition	Symbol	Comments
00	1	U	Unconditional (always = 1)
01	$MBR\ (I)$	I	Indirect address bit
10	$AC\ (S)$	S	Sign bit of AC
11	$AC = 0$	Z	Zero value in AC

(c) CD (condition) field bit assignment:

BR	Symbol	Function
00	JMP	$CAR \leftarrow$ ADF if condition = 1 $CAR \leftarrow CAR + 1$ if condition = 0
01	CALL	$CAR \leftarrow$ ADF, $SBR \leftarrow CAR + 1$ if condition = 1 $CAR \leftarrow CAR + 1$ if condition = 0
10	RET	$CAR \leftarrow SBR$ (Return from subroutine)
11	MAP	$CAR\ (2\text{–}5) \leftarrow MBR\ (OP)$, $CAR\ (1, 6, 7) \leftarrow 0$ (Micro-operation mapping)

(d) BR (branch) field bit assignment:

Microinstruction format and bit assignment.