Ex/CP/31C/8/2006

B. C. S. E. PART I EXAMINATION, 2006

(1st Semester)

SYSTEMS PROGRAMMING

Time : Three hours Full Marks : 100

GROUP - A

Answer ***all*** questions.

1. The format of the machine code for the MOV instruction of the iAPX-86 is given below :

l00010dw mod reg r/m (DISP-LO) (DESP-HI)

Register/memory to/from register

1100011w mod 000 r/m (DISP-LO) (DESP-HI) data data if w=1

Immediate to register/memory

1011w reg data data if w=l

Immediate to register

1010000w addr-1o addr-hi

Memory to accumulator

1010001W addr-lo addr-hi

Accumulator to memory

10001110 mod O SR r/m (DISP-LO) (DESP-HI)

Register/memory to segment register

10001100 mod O SR r/m (DISP-LO) (DESP-HI)

Segment register to register/memory

[Turn over

r/m	EA	
000	(BX)+(SI)+DISP	mod=ll r/m is treated
001	(BX)+(DI)+DISP	as reg
010	(BP)+(SI)+DISP	= 00 DISP = 0*
011	(BP)+(DI)+DISP	= 01 DISP = disp-lo
100	(SI)+DISP	(sign-extended
101	(DI)+DISP	to 16-fits)
110	(BP)+DISP*	= 10 DISP=disp high : disp-lo
111	(BX)+DISP	*If mod=00 and r/m=110 then EA=disp-high : disp-lo

reg	16-bit (w=1)	8-bit (w=0)	Segment	
000	AX	AL	00	ES
001	CX	CL	01	CS
010	DX	DL	10	SS
011	BX	BL	11	DS
100	SP	AH	If d=1 then “to” reg.	
101	BP	CH	If d=0 then “from” reg.	
110	SI	DH	If w=l then word instruction	
111	DI	BH	If w=0 then byte instruction	

The following variables have been defined in the data segment:

Variable	offset
HEXCNT	000CH
SWITCH	0088H
TABLE	A02EH

Find the machine code for each of the following instructions. Show the order of bytes as they would be loaded in memory.

1.1	MOV	DL, BYTE PTR HEXCNT	
1.2	MOV	WORD PTR SWITCH, 600D	
1.3	MOV	BYTE PTR [BX], AL	
1.4	MOV	[BX+2], CX	
1.5	MOV	[BP], AX	
1.6	MOV	DX, TABLE [SI]	
1.7	MOV	AL, [BX] [SI]	
1.8	MOV	[BP-12], AX	
1.9	MOV	AL, ES : BYTE PTR [BX] [SI]	
1.10	MOV	CL, [2000 H]	10×3=30

2. A direct intrasegment short jump has opcode EB whereas a direct intrasegment near jump has opcode E9.
Find the machine code for the JMP instructions in each of the following code fragments. Give reasons in brief.

2.1
```
0165        ERASE :
≡                       JMP   ERASE
0184
```

2.2
```
03AB        HERE :
≡                       JMP   HERE
044A
```

2.3
```
0193        JMP   COL                    3×5=15
≡                                        [ Turn over
01A6        COL :
```

GROUP - B

Answer *all* questions.

3. Consider the following portion of a SIC object program :

   T, 002039, IE, 041030, 001030, E0205D, 30203F, D8205D, 281030, 302057, 549039, 2C205E, 38203F.

   Here the commas (,) have been shown only to improve readability and are not actually present in the object program.

   Show the memory map (address is contents) of the above code after loading. 5

4. Consider the following portion of a SIC program :

Line	Source Statement		
0	COPY	START	1000
1	EOF	BYTE	C'EOF'
2	THREE	WORD	3
3	ZERO	WORD	0
4	RETADR	RESW	1
5	LENGTH	RESW	1
6	BUFFER	RESB	4096
9			
10	FIRST	STL	RETADR
15	CLOOP	JSUB	RDREC
20		LDA	LENGTH
25		COMP	ZERO
30		JEQ	ENDFIL
35		JSUB	WRREC
40		J	CLOOP

Determine the content of the symbol Table constructed by a ONE-PASS ASSEMBLER after scanning list 3r. In such an assembler, a symbol used but not yet defined has, in the symbol table entry, a linked list of locations where the references to it are made. 5

5. Consider the following grammar :

<id-list> : : = id |<id-test>, id
<stmt-list> : : = <stmt> |<stmt-list>; <stmt>
<stmt> : : = <assign> |<read>| <write>
<assign> : : = id : = <exp>
<exp> : : = <term> | <exp> + <term> | <exp> − <term>
<term> : : = <factor>|<term>*<factor>|<term>DIV<factor>
<factor> : : = id|int|)<exp>)
<read> : : = READ (<id − list >)
<write> : : = WRITE (<id − list>)

Construct partial parse trees for the following sentences. The root of suet a tree may be any of the nonterminals listed above.

5.1 X : = 0; Y : = 0
5.2 M : = X DIV 100
5.3 WRITE (M, W) 3×5=15

GROUP - C

Answer any *six* questions.
Choose the unique correct answer.

6. The LOOP instruction of the iAPX-86 uses the register
   a) AX
   b) BX
   c) CX
   d) DX

7. A macro-time looping statement is
   a) a CPU instruction
   b) an instruction to a compiler for in-line assembly
   c) Processed by the macro processor
   d) all of the above

8. In Operator-Precedence Parsing, precedence relations are defined between
   a) two terminals
   b) two nonterminals
   c) a terminal and a nonterminal
   d) all of the above

9. In Pass-1 of the SIC assembler, if the opcode is START, the starting address is
   a) 0
   b) unknoun
   c) # [OPERAND]
   d) 3 * # [OPERAND]

10. In its first pass, a two-pass assembler saves in its symbol table.
    a) Program counter (PC) values
    b) location counter (LOCCTR) values
    c) both PC and LOCCTR values
    d) none of the above

11. Pass-1 of a linking loader enters a symbol in ESTAB if the record types containing the symbol is
    a) E
    b) T
    c) D
    d) M

12. The WHILE-ENDW construct of the SIC/XE assembly
    language denotes.
    a) loop construct resembling LOOP of iAPX-86
    b) a facility for implementing loops by microprogramming
    c) macro-time looping
    d) none of the above 6×1=6

GROUP - D

Match the correct pasis :

Set X		**Set Y**
13) Lexical Analysis	(a)	Object Program
14) SET	(b)	Location Counter
15) *	(c)	Defining constants
16) CSADDR	(d)	Tokens
17) Intermediate Fill	(e)	Linker
18) EQU	(f)	Macro-time variable
19) Text record	(g)	Assembler 7×2=14

[Turn over

GROUP - E

Answer any ***five*** questions.

Fill in the blanks. 5×2=10

20. If the effective address in an iAPX-86 instruction is (BX)+(DI), the addressing mode is _____ _____

21. For the iAPX-86 instruction JGE, the branch is taken if _____ _____ _____ = 0

22. When control sections form logically related parts of a program, it is necessary to provide some means for _____ them.

23. If is converient to regard a high level language program statement as a sequence of _____

24. In iAPX-86, a segment must begin on a _____ boundary.

25. A/An _____ loader performs no relocation.

26. In DEFTAB, a macro processor uses _____ notation for parameters.