NAME: G. Nithish

Reg No: 19BCS0012

Course : System software

① What are assembler directives?

* They Provide instruction to the assembler itself.

* They are not translated into machine operation code:

* The assembler directive also known as D. Pseudo instruction.

Example Assembler directives:-

* START   * BYTE   * WORD

* END   * RESB   * RESW.

Usage of Assembler directive

START : Specify name & starting address.

END : end of source program, specify the first execution instruction.

BYTE : Generate character or hexa decimal constant, occupying as

many bytes as needed to represent the contant.

WORD : Generate one-word integer constant

RESB : Reserve the indicated number of bytes for a data area.

RESW : Reserve the indicated number of word for a data area.

END of record : a null char (00)

End of file : a zero-length record.

END : END directives terminates an assembly languag program.
which means terminates the program when it encounters the end of file

② What are the record formats used in an object program?

Ans

Three types of records

a. They are

* Header   * Text

* END

Header record: Contain program name, starting addressing, length.

Text record: The text record contains the machine code instruction, Program data, address.

END record : the END record mark end of object program and includes program starting address.

Header record:

format:

1	H
2-7	Program name
8-13	Starting address of object program (hexadecimal)
14-19	Length of object program in bytes (hexadecimal)

Example: Header

H∧ <u>COPY</u> ∧ <u>001000</u> ∧ <u>00107A</u>
　　　2-7　　　8-13　　　14-19

program name　Starting address of obj program　length of obj program in bytes

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Text record:

1	T
2-7	Starting address for obj code in record
8-9	Length of object code in this record in bytes
10-69	object code, represented in hexadecimal

T∧ 001000 ∧ 1E ∧ [141033 ∧ 482039 ∧ 001036 ∧ 281030
∧ 301015 ∧ 482061 ∧ 3C1003 ∧ 001002A ∧ 0C1039 ∧ 00102D]

Text record Start's	Length of object code in this record in bytes. Length of object cod = 1E	object code in hexa decimal

$10 \times 3 \Rightarrow 30 D$] Hexo
1E (Hex) = 30D

END record :

1   E

2-7   Address of first executable instruction
      in object program (hexa)

eg.

$$E_\wedge \underline{001000}$$

1 END   2-7
             first executable
             instruction in object
             Program.

---

② List out the function of each data
   structure used in assembler.

Ans

   the data structures in assembler..

   *》 OPTAB   *》 LOCCTR :

   *》 SYMTAB

Function:-

OPTAB:

   ＊ ~~OPto~~ OPTAB is used to took up
   mnemonic operation code and
   translate them to their machin languag
   equivalents .
        ＊ LDA → 00   *》 STL → 14, . .

the operation code Table (OPTAB)

*> Contain the mnemonic operation & its machine language equivalents (at least).

*> Contain instruction format & length.

*> Pass 1, OPTAB is wed to look up and validate operation code.

*) Pass 2, OPTAB is wed to translate the operation code to machine language.

* In SIC/XE, assembler search OPTAB in pass1 to find the instruction length for incrementing LOCCTR.

*> Organize as a hash table (static table)

SYMTAB:

↳ SYMTAB used to store values (address) assinged to labels.

*> COPY → 1000, FIRST → 1000.

Function:

↳ Include name and value (address) for each label.

★ Include flags to indicate error condition.

★) contain, type, length.

∗) Pass1 label are entered into SYMTAB, along with assinged address (from LOCCTR).

∗) Pass2 symbol used as operands are look up in symtab to obtain address.

∗) organize as a hash table (static table)

★ The entries are rarely

Location Counter LOCCTR.

★) LOCCTR is a variable for assignment address.

∗) LOCCTR is initialized to address specified in start.

∗) when reach a label the current value of LOCCTR gives the address to be associated with that label.

④ What is modification record?

⇒ An object Program that contains
information needed for address modification
for loading.

⇒ The only portion of the assembled program
that contain addresses are the extended
format instructions

FORMAT :

col 1   M

col 2-7   starting location of the address
field to be modified, relative to
the beginning of the program.

col 8-9   length of the address field to
be modified in half bytes.

Modification record added to object files

Example

```
HCOPY 001000 001077
T000000 ID 17202D. 4B10B36 ...
T0 0001D......
M000007 05 ⟵ Modification
                      Record.
...
E000000
```

External symbol:

M^000000 ^05 +RDREC

M^000028 ^06 +BUFEND

M^000028 ^06 −BUFFER