SS Module III Important Questions

1. Conversion of SIC/XE program

2. Explain program relocation

- Sometimes we need to load and run several programs at the same time
  - The system must be able to load these program wherever there is place in memory
  - These programs are loaded at several locations
  - So we dont know the exact starting Until load time
- Absolute Program
  - In this address is mentioned during assembling itself

    Eg: Consider the instruction:

    101B LDA THREE 00102D
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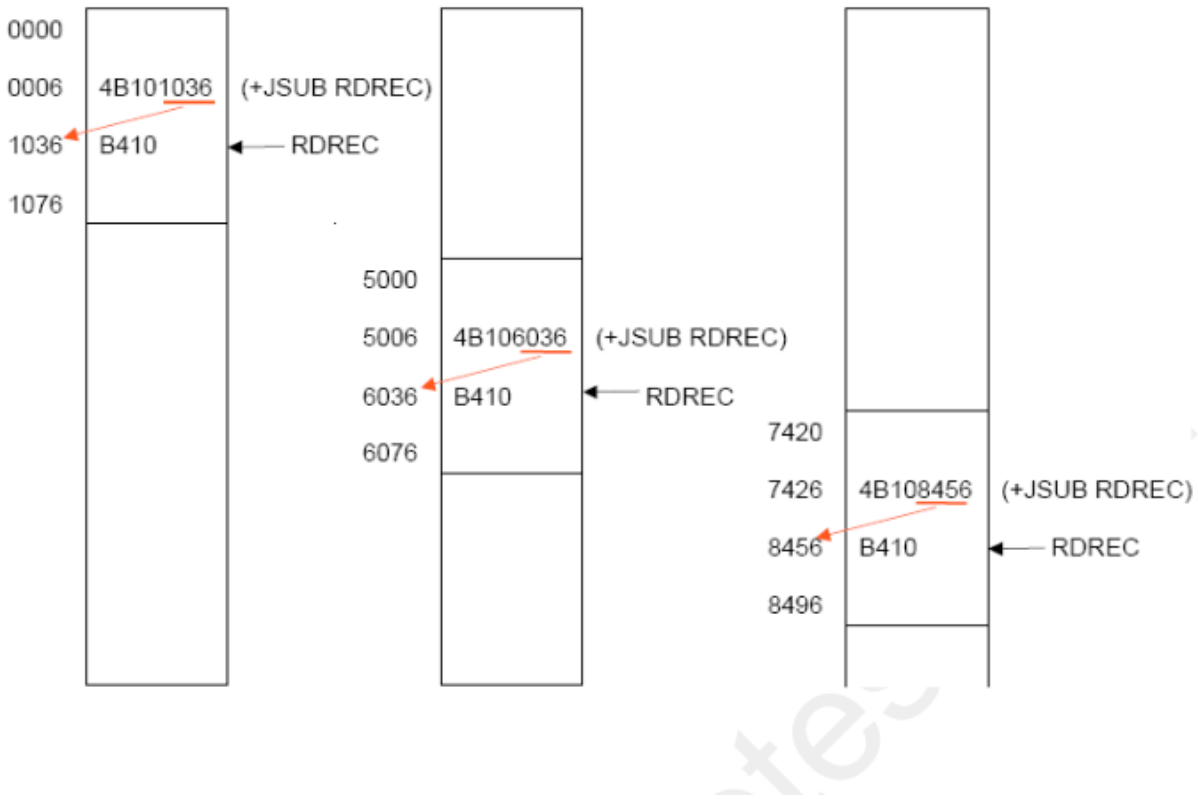
    - Here 00102D is the location of register A
  - Suppose we decide to load and execute this program at location 2000 instead of location 1000
    - Then the 102D address is no longer available since it was placed relative to the starting address earlier, which was 1000
  - So we need to make change in the address porion of instruction so loading and execution is possible at location 2000
- An object program that has the information necessary to perform this kind of modification is called the relocatable program



- First figure, the program is loaded at 1000
  - Second figure its relocated to 6000
    - JSUB is moved from 1036 -> 6036
    - Third its again relocated to 7420
- The remaining addresses change accordingly
- Only part of the program that require modification at load time are those that specify direct address(Format 4)
- The instruction that doesnt require modification
  - Immediate Addressing
  - PC Relative
  - Base relative
- For an address label its address assigned relative to the start of the program
  - The assembler produced a modiciation record to store
    - the starting location
    - length of the address field to be modified

3. Write the format for modification record and give example.

Modification record

Col. 1 M

Col. 2-7 Starting location of the address field to be modified, relative to the beginning of the program (Hex)

Col. 8-9 Length of the address field to be modified, in half-bytes (Hex)

- One modification record is created for each address to be modified
- Length is stored in 4 bits (half bytes)
  - So each of these numbers is a half byte
    - in 01036
      - 0 is a half byte
      - 1 is a half byte and so on
- 0006
  - 4 bytes it will take
    - 4B in address 6
    - 10 in address 7
    - 10 in address 8
    - 36 in address 9
- 01036 is the address field to be modified
  - The length of this address field is 5 (half bytes)

Eg: Consider the instruction

0006 CLOOP +JSUB RDREC 4B101036

where RDREC is at the address 1036. The modification record for this instruction can be written as

M00000705

4. What are literals? How the assembler handles literals

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5. Explain EQU and ORG assembler directives with example.

- EQU
  - Most assemblers provide an assembler directive that allows the programmer to define symbols and specify their values. The directive used for this EQU (Equate). The general form of the statement is

    Symbol EQU value
- ORG
  - This directive can be used to indirectly assign values to the symbols.
  - Changes value in the location counter

6. What are the different types of expressions? Give examples.

- Absolute Expressions
  - The expression that uses only absolute terms is absolute expression
- Relative Expressions
  - All the relative terms except one can be paired
- Neither absolute nor relative
  - Expressions that do not meet the conditions for either absolute or relative are neither absolute nor relative. They are considered as errors.

7. Differentiate between control sections and program blocks.

Program blocks

- Program blocks allow the generated machine instructions and data to appear in the object program in a different order by Separating blocks for storing code, data, stack, and larger data block
- Program blocks refer to segments of code that are rearranged within a single object program unit.

Control Sections

- A control section is a part of the program that maintains its identity after assembly; each control section can be loaded and relocated independently of the others.
- Different control sections are most often used for subroutines or other logical subdivisions. The programmer can assemble, load, and manipulate each of these control sections separately.
- Control sections differ from program blocks in that they are handled separately by the assembler.

8. Write the format of Define and Refer records.

- A define record gives information about the external symbols that are defined in this control section, Symbols are named by EXTDEF
- A Refer record lists the symbols that are used by external references by control section
- Define record format

Col. 1	D
Col. 2-7	Name of external symbol defined in this control section
Col. 8-13	Relative address within this control section (hexadecimal)
Col.14-73	Repeat information in Col. 2-13 for other external symbols

- Refer record format

Refer record (EXTREF)

Col. 1	R
Col. 2-7	Name of external symbol referred to in this control section
Col. 8-73	Name of other external reference symbols

9. Explain EXTDEF and EXTREF

- EXTDEF
  - It is the statement in a control section, names symbols that are defined in this section but may be used by other control sections.
- EXTREF
  - It names symbols that are used in this section but are defined in some other control section

10. Write the working of one pass assembler

11. Explain multipass assembler with example