Midterm Exam. of System Software,   Chap 2.2--2.4   2022/Nov/07   (1/2)

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1. 10%

Write an SIC/XE assembly to compute alpha = beta ^ n where alpha, beta and n are all integers and defined as shown below.
You may assume n >= 0.

```
alpha    resw    1
beta     resw    1
n        resw    1
```

2. 20%

Do pass 1 for following SIC/XE program.
First copy the program to your answer sheet. Calculate and write the loc on the left side.

```
rand      start    0
first     stl      retadr
          ldb     #buf
          base     buf
          jsub     getnum
         +jsub     shuf
          j       @retadr
          byte     c'Hello'
nums      resw     128
retadr    resw     1
getnum    clear    x
inloop    td       indev
          jeq      inloop
          rsub
indev     byte     x'F3'
buf       resb     2048
shuf      rsub
          end      first
```

3. 30%

Do pass 2 for following SIC/XE program.
First copy the program to your answer sheet. Calculate and write the object codes on the right side, and write the object file.

```
0000   hash     start    0
0000   go       stl      retadr
0003            ldb     #dst
                base     dst
       .
0006            clear    x
0008            ldt      length
       .
000B   loop     lda      src,x
000E            shiftl   a,3
0010            mul     #17
0013            add     #513
0016            sta      dst,x
       .
0019            tixr     t
001B            jlt      loop
001E            j       @retadr
       .
0021   length   resw     1
0024   retadr   resw     1
0027   src      resw     1024
0C27   dst      resw     1024
1827            end      go
```

4. 15%

Translate the literal statements in following program and write an equivalent one just like figure 2.10 but without loc and object code.

```
GETN    START  0
RETADR  RESW   1
        LTORG
GO      STL    RETADR
     .......
        JSUB   GETC
        COMP  =X’00001F’
     .......
        J     @RETADR
        LTORG
GETC    TD    =X’F3’
        RD    =X’F3’
     .........
        RSUB
        END   GO
```

5. 10%

In order to assemble in one pass, the author proposes moving all data to the beginning of programs.
Are the methods discussed in the text for one pass assembling (written to memory or a file) still workable if data are not forced to move to the beginning? Why or Why not?

6. 15%

Write the object file for the following program.
That is, the H, D, R, and E records.
Also write T and M records related to REF1 and REF2.
(Refer to figur 2.17 and figure 3.9)

```
0000  TOPASS  START   0
              EXTDEF  BUFA,ENDA
              EXTREF  BUFB,ENDB
              .
              .
              .
0030  BUFA    EQU     *
              .
              .
004A  ENDA    EQU     *
004A  REF1    WORD    ENDA-BUFA+BUFB
004D  REF2    WORD    ENDB-BUFB+ENDA
              END     TOPASS
```