**IS52A3/ IS602(O)**

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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE - 560 054

SEMESTER END EXAMINATIONS - JANUARY 2016Course & Branch : **B.E.- Information Science & Engg.** Semester : **V**Subject : **System Software**Max. Marks : **100**Subject Code : **IS52A3 / IS602 (O)**Duration : **3 Hrs****Instructions to the Candidates:**

- Answer one full question from each unit.

UNIT-I

1. a) i. Illustrate the role of the flag bits 'n', 'i', 'x' in addressing modes of C01 (10)
format 3 and 4 SIC/XE instructions.
ii. Design the pass-1 of the two-pass assembler.
- b) Suppose FILE is the name of the program written for SIC machine and its C01 (04)
length is 0029. Write the object program for the COPY which has the
following machine codes:

<u>Loc</u>	<u>Object code</u>
2000	141033
2003	482039
2006	001036
2009	281030
200C	301015
200F	482061
2012	3C1003
2015	00102A
2018	0C1039
201B	05
201C	0C1036
201F	482061
2022	08
2023	4C0000
2026	0C1020

- c) Discuss the SIC Machine architecture. C01 (06)

- 2 a) Generate the object code for the following SIC program using 2-pass C01 (08)
assemblers. Also create the symbol table.

Opcodes for STL - 14, JSUB - 48, LDA - 00, COMP - 28, JEQ - 30, LDX-
04, RSUB - 4C

COPY START 2000

FIRST STL RET

CLOOP JSUB RDR

LDA LEN

COMP ZER

JEQ CLOOP

LDA CHA

CHA BYTE C'EF'

RET RESW 1



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LEN RESW 1
ZER WORD 0
BUF RESB 10
RDR LDX ZER
RSUB
END FIRST

- b) Provide the format of the text and end records used in object program. C01 (06)
c) Indicate the type, size and meaning of the instruction with respect to C01 (06)
flags of the following SIC/XE instructions.
- i) LDX #0
 - ii) LDA Alp, X
 - iii) +JSUB WRREC

UNIT-II

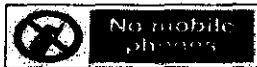
- 3 a) Generate the object code for each instruction of the SIC/XE program C02 (10)
given below using a 2-pass assembler.

The Opcodes are: LDA=00, ADD=18, STA= 0C,
CLEAR=B4,SUB=1C,LDB=68.

```
START 0
first LDA @t1
      ADD # t2
      STA t3 , X
      CLEAR A, S
      +SUB t4
      LDB #5
t1 RESW 4
t2 RESB 6
t3 WORD 9
t4 BYTE X'1234'
      END
```

- b) Provide the format of the modification record. With suitable illustrations C02 (05)
indicate why modification records are generated only for format 4
instructions.
- c) What is the forward reference problem? How is this resolved by C02 (05)
assemblers? Illustrate with an example.
4. a) Generate the object program for the following SIC/XE program. Given C02 (08)
that the opcode of LDA = 00, LDT=74, LDX = 04.

```
PROGA START 0000
      EXTDEF LA,EA
      EXTREF LB,EB
0020 R1 LDA LA
0023 R2 +LDT LB+4
0027 R3 LDX #EA - LA
002A LA EQU *
002A R4 WORD EA-LA
002D EA EQU *
002D R5 WORD EA-LA-(EB-LB)
0030 R6 WORD LB-LA
      END R1
PROGB START 0000
      EXTDEF LB,EB
      EXTREF LA,EA
0036 R1 + LDA LA
```



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```
003A R2 LDT LB+4
003D R3 +LDX #EA - LA
0040 LB EQU *
0040 R4 WORD EB-LB
0043 EB EQU *
0043 R5 WORD EA-LA-(EB-LB)
0046 R6 WORD LB-LA
      END R1
```

- b) What is a control section? Explain the modifications to be done to the object program for a source program having control sections. C02 (06)
- c) Illustrate the concept of multi pass assembler with an example. C02 (06)

UNIT-III

5. a) Write note on C03 (10)
i. MS-DOS linker.
ii. Automatic Library Search
- b) For the given object program explain how relocation is achieved using bit masks. Provide the output of the relocation loaders given that the starting address given by the operating system is 3000. C03 (05)
- Input File:**
H COPY 000000 00
T 000000 C40 141033 481039 901776 921765 345610 571765
T 002011 E00 232838 432979 892060 662849 340000
E 000000
- c) With a flowchart discuss the processing of an object program using linkage editors. C03 (05)
6. a) Provide and describe the source code of the bootstrap loader for SIC/XE. C03 (10)
- b) What is dynamic linking? Describe the process of loading and calling of a subroutine using dynamic linking. C03 (10)

UNIT-IV

7. a) Expand the following macro invocation statements using the given macro definition- C04 (06)
Function f2,Q,(10,20,30) followed by
Function f1,R, 40
- Macro definition**
Function MACRO &I, &Len, &List
&C1 SET %NITEMS(&List)
+LDT #4096
\$Loop TD =X'&I'
JEQ \$Loop
RD =X'&I'
&C2 SET 1
WHILE (&C2 LE &C1)
COMP =X'0000&List[&C2]'
JEQ \$Exit
&C2 SET &C2+1
ENDW
TIXR T
JLT \$Loop
&Exit STX &Len
MEND



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- b) Explain the various data structures used in the implementation of one pass macro processor with an example. C04 (09)
- c) Write a note on Concatenation of Macro parameters. C04 (05)
8. a) Illustrate with an example, explain the following: C04 (08)
- i) Generation of unique labels
 - ii) Keyword Macro parameters
- b) Write a short note on macro processing within language translators. C04 (06)
- c) Consider a built-in function named %SIZE to the macro processor which returns the number of bytes occupied by the corresponding argument. C04 (06)
- Indicate the expanded code generated by the microprocessor for the following program.
- ```
P8 START 0
MOVE MACRO &FROM,&TO
&LENGTH SET %SIZE(&FROM)
 IF (&LENGTH EQ 1)
 LDCH &FROM
 STCH &TO
 ELSE
 LDX #&LENGTH
 LDS &FROM
 LDT &TO
 JSUB MOVERTN
 ENDIF
MEND
FIRST MOVE A,B
 MOVE C,D
 RSUB
A RESB 1
B RESB 1
C RESB 500
D RESB 500
```

## UNIT-V

9. a) Indicate the steps of compiling and running a YACC program. C05 (04)
- b) Write a lex program to count number of positive and negative numbers (integers and fractions). C05 (08)
- c) Write a YACC program to recognize a valid identifier, which starts with a letter or underscore, followed by any number of letters or digits. C05 (08)
10. a) Write a YACC program to evaluate an valid arithmetic expression. C05 (09)
- Note: Write the LEX part of the program. Consider precedence and associatively.
- b) Indicate the type of inputs accepted by the following regular expressions. C05 (05)
- i. C[1,3]
  - ii. -?[0-9]+
  - iii. 0/1
  - iv. or|and|but
  - v. [a-zA-Z]\*
- c) With examples describe the terminal and non terminal symbol used to define a grammar. C05 (06)

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