Roll No. ☐☐☐☐☐☐☐☐.☐☐

S. No. of Question Paper : **8837**

Unique Paper Code : 234303 .   C

Name of the Paper . : System Programming·

Name of the Course ·: **B.Sc. (H) Computer Science Part II**

Semester . : **III**

Duration : **3 Hours**   Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

The question paper consists of *two* Sections.

Section A is compulsory. Attempt any *four* questions from Section B.

Section A

1. (a) What is context-sensitive grammar ? Why is it not widely used ? . 3

   (b) List the various instruction formats of SIC/XE machine. 4

2. (a) What is the difference between the following :

   (i) Literal and immediate operand

   (ii) Compiler and Interpreter. - 4

   (b) How should a programmer decide whether to use a macro or subroutine to accomplish a given logical function ? 3

3. (a) What are the advantages and limitations of Linkage editors ? 4

   (b) What is Bootstrap loader ? 3

4. (a) What is the purpose of assembler directives :

   (i) USE

   (ii) ORG

   (iii) RESW

   (iv) EQU.. 4

   (b) State the purpose of lexical, syntactic and semantic analysis. 3

13. (a) Explain the difference between linking loader and linkage editor. 4

    (b) How compilers for most high level language store arrays ? 2

    (c) What do you mean by Prologue and Epilogue with respect to an activation record ? 4

14. (a) How BNF Grammar is used to describe syntax ? 3

    (b) What is a program translation ? Give its characteristics. 3

    (c) What is a LPDT ? Write a brief description of YACC. 4

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5. (a) What are P-code compilers ? 3

    (b) Consider the following grammar :

        <write> → (<id-list>)

        <id-list> → id { , id}

    Here, id is a terminal symbol and {} designate repetition of a symbol zero or more times. Show steps to generate parse tree using recursive descent parser. 4

Section B

6. (a) State the functions of back end of a language processor. 4

    (b) Consider the following code :

```
              LDS      #3
              LDT      #300
              LDX      #0
     ADDLP    LDA      ALPHA, X
              ADD      BETA, X
              STA      GAMMA, X
              ADDR     S, X
              COMPR    X, T
              JLT      ADDLP
              --
              --
              --
     ALPHA    RESW     100
     BETA     RESW     100
     GAMMA    RESW     100
```

Show the contents of symbol table that would be generated by an assembler. 3

(c) Give the format of define record, refer record and end record in the object program. 3

7. (a) How is relocation done using modification record ? 2

(b) Assemble the following SIC source program :

SUM	START	4000
FIRST	LDX	ZERO
	LDA	ZERO
LOOP	ADD	TABLE, X
	TIX	COUNT
	JLT	LOOP
	STA	TOTAL
	RSUB	
TABLE	RESW	2000
COUNT	RESW	1
ZERO	WORD	0
TOTAL	RESW	1
	END	FIRST

Opcodes for the Mnemonics are :

LDX	04
LDA	00
ADD	18
TIX	2C
JLT	38
STA	0C
RSUB	4C

5

Opcode for the Mnemonics are :

LDT	
	74
LDX	
	04
LDCH	
	50
STCH	
	54
TIXR	
	B8
JLT	
	38

(b) Explain with an example how concatenation operator is helpful to concatenate macro instruction parameter with character strings. 4

11. (a) What is the advantage of rearranging a program in the form of program blocks ? 3

(b) Describe the data structure used in macro processor algorithm. 3

(c) What is Lexical Analysis ? 4

12. (a) What is the disadvantage of an absolute loader and how can it be overcome by relocating loader ? 3

(b) Explain recursive macro expansion with suitable example. 3

(c) Give a comparison of context-free and context-sensitive grammar. 4

(b) How relocation is done by Modification Record ? Explain the following Modification Record : M00000705.

3

(c) What do you mean by Recursive Descent Parsing ?

4

10. (a) Assemble the following SIC/XE object code and show object code as would appear in object file :

4+2

```
STRCP2    START         1000
FIRST     LDT           #11
          LDX           #0
MOVECH    LDCH          STR1,X
          STCH          STR2,X
          TIXR          T
          JLT           MOVECH
STR1      BYTE          C'TEST STRING'
STR2      RESB          11
          END           FIRST
```

(c) Design a Finite Automaton over the alphabet {0,1} which accepts strings starting with 0.

3

8. (a) Consider the following code :

Loc

```
          PROG    START    0
                  EXTDEF   A
                  EXTREF   B

0020              LDA      A
0023              +LDT     B+4
```

Write the define record, refer record and modification record that will be generated for the above code. The required relative addresses are given along with the statements.

4

3

(b) Describe Automatic Library Search.

3

(c) Write a Macro to swap two numbers and write a statement to invoke this Macro.

3

9. (a) How are macro instruction parameters concatenated with other character strings ? Describe with an example.

3

(b) What is a block structured language ? Show how a compiler uses a display data structure for accessing variables in a block.

4

(c) Which factors determine whether a compiler be designed as one-pass or multi-pass ?

3

10. (a) What is a basic block in a program ? How does it help in code optimization ?

3

(b) How are literals processed by an assembler ?

4

(c) Write a LEX program that recognizes positive integers.

3

11. (a) What is program counter relative addressing mode ? Is relocation required in this mode ? Why ?

3

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6. Explain Finite Automata (FA) with the help of an example. 4

7. Write short notes on the following : 6

   (a) Storage allocation

   (b) Semantic analysis.

8. Define Ambiguous Grammar. Consider the following grammar :

   $$S \rightarrow if\ E\ then\ S\ |if\ E\ then\ S\ else\ S|\ OTHER$$
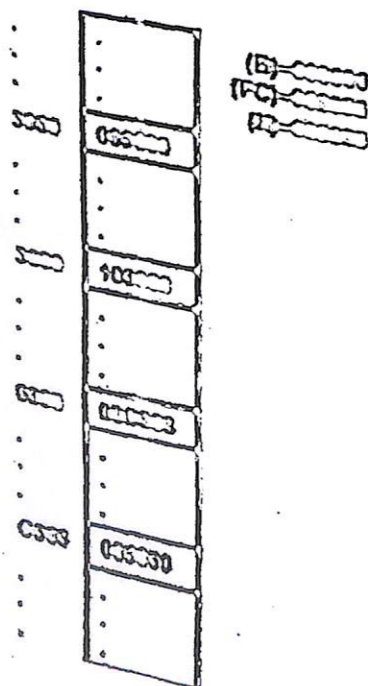
   Check for ambiguity of the following :

   If E1 then if E2 then S3 else S4. 5

Section B

9. (a) Consider the memory contents shown in the following figure. What would be loaded to register A with the object code 022030 (Hex) ? Justify your answer. 3

(b) Why the following code cannot be handled by a simple two pass assembler :

ALPHA	EQU	BETA
BETA	EQU	DELTA
DELTA	RESW	1

3

(c) Consider the following conditional macro :

```
COND     MACRO &A, &B, &C
         IF      (&C  NE  ' ')
         CLEAR  A
         CLEAR  X
         ENDIF
         IF (&A EQ 1)
         INC  A
         RMO A,S
         ENDIF
         IF (&B NE 1)
         COMPR  A, S
         JEQ EXIT
         ENDIF
$EXIT    STA D
         MEND


D        RESW 1
```

Expand the above macro for the following macro calls :

   (i) COND 1 2   4

   (ii) COND 2 2 3

1,100

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This question paper contains 4+1 printed pages]

S. No. of Question Paper : 6071

Unique Paper Code : 234303

Name of the Paper : System Programming

Name of the Course : B.Sc. (Hons.) Computer Science (CSHT-306)

Semester : III

Duration : 3 Hours

Roll No.

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Maximum Marks : 75

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The question paper consists of *two* Sections.

Section A is compulsory.

Attempt any *four* questions from Section B.

Section A

1. Differentiate between the following :

   (a) System Software and Application Software

   (b) Absolute and Relative Expression.   6

2. List the format of 3 byte and 4 byte instructions available in SIC/XE machine.   3

3. What typical options are available in a loader ?   4

4. Explain LOCCTR maintenance during generation of object code.   3

5. Give the format of the following :

   (a) Define Record

   (b) Refer Record.   4

9. (a) Write a JavaScript function to input two 2 * 2 arrays of numbers and add them.   3

   (b) Write a JavaScript function to input a string, display all the words in the string along with their lengths.   2

   (c) Write the syntax and use of the following JavaScript functions :   4

      (i) indexof( )

      (ii) split( ) in string object.