Indian Institute of Information Technology, Vadodara
CS204 – System Software
B.Tech. (CSE) – IVth Semester
Winter 2022-23 – Mid - Semester Examination

[Time – 2 Hour] **[Total Marks - 60]**

Instructions:

- **All Questions are compulsory.**
- **All questions are self-explanatory and understanding of question is a part of evaluation.**
- **No query regarding questions will be entertained during examination by course instructor or invigilator.**

PART A – (16 x 1 = 16 Marks)
(Multiple Choice Questions)

- **In each question more than 1 correct answer may be possible.**
- **For each correct answer 1 marks will be given, and for each wrong answer 0.25 marks will be deducted.**

1. A grammar that produces more than one parse tree for some sentence is called

a) Ambiguous **b)** Unambiguous

c) Regular **d)** None of the mentioned

2. The linker

a) Is similar to interpreter **b)** Uses source code as its input

c) Is required to create a load module **d)** None of the mentioned

3. Which of the following are Lexemes?

a) Identifiers **b)** Constants

c) Keywords **d)** All of the mentioned

4. Given the following expression grammar:

E -> E * F | F+E | F

F -> F-F | id

which of the following is true?

a) * has higher precedence than + **b)** - has higher precedence than *

c) + and - have same precedence **d)** + has higher precedence than *

5. The number of tokens in the following C statement is

```
printf("i = %d, &i = %x", i, &i);
```

a) 3 **b)** 26 **c)** 10 **d)** 21

6. Which of the following derivations does a top-down parser use while parsing an input string? The input is assumed to be scanned in left to right order

a) Leftmost derivation

b) Leftmost derivation traced out in reverse

c) Rightmost derivation

d) Rightmost derivation traced out in reverse

7. Which of the following describes a handle (as applicable to LR-parsing) appropriately?

a) It is the position in a sentential form where the next shift or reduce operation will occur most derivation

b) It is non-terminal whose production will be used for reduction in the next step

c) It is a production that may be used for reduction in a future step along with a position in the sentential form where the next shift or reduce operation will occur

d) It is the production p that will be used for reduction in the next step along with a position in the sentential form where the right hand side of the production may be found

8. What is the similarity between LR, LALR and SLR?

a) Use same algorithm, but different parsing table.

b) Same parsing table, but different algorithm.

c) Their Parsing tables and algorithm are similar but uses top down approach.

d) Both Parsing tables and algorithm are different.

9. Cross-compiler is a compiler

a) Which is written in a different language from the source language?

b) That generates object code for the machine it is running on.

c) Which is written in the same language as the source language?

d) That runs on one machine but produces object code for another machine

10. Which of the following grammar rules violate the requirements of an operator grammar? P, Q, R are non-terminals and r, s, t are terminals 2

(A). $P \rightarrow QR$ (B). $P \rightarrow QsR$

(C). $P \rightarrow \varepsilon$ (D). $P \rightarrow QtRr$

a) (A) Only **b)** (A) and (C) only

c) (B) and (C) only **d)** (C) and (D) only

11. Which of the following is not an example of system software?

a) Word Processors
b) Language Translator
c) Utility Software
d) Communication Software

12. _____ is designed to solve a specific problem or to do a specific task.

a) System Software
b) Utility Software
c) User
d) Application Software

13. Which of the following system software resides in main memory always?

a) Loader
b) Linker
c) Text editor
d) Assembler

14. The linker?

a) is required to create a load module
b) is always used before programs are executed
c) is same as the loader
d) None of these

15. System software may be defined as a set of one or more programs intended to manage the operation of ..... system.

a) Computer
b) Machine
c) Application
d) Operating

16. SIC points to ..... which is a imaginary computer that has been intended to comprise the hardware traits most frequently found on real machines, while averting unusual and immaterial complexities.

a) Operating System
b) Instruction
c) Simplified Instruction Computer
d) Test Device (TD)

PART B □(2 x 2 = 4 Marks)
(Link Based Questions)

Question no. 11 and 12 are linked together, so if answer of question no. 11 is wrong, then question no. 12 will not be evaluated

17. For the grammar below, a partial LL(1) parsing table is also presented along with grammar. Entries that need to be filled are indicated as E1, E2, and E3. **2**

$S \rightarrow a\ A\ b\ B \mid b\ A\ a\ B \mid \varepsilon$

$A \rightarrow S$

$B \rightarrow S$

	a	b	$
S	**E1**	**E2**	$S \rightarrow \varepsilon$
A	$A \rightarrow S$	$A \rightarrow S$	error
B	$B \rightarrow S$	$B \rightarrow S$	**E3**

The FIRST and FOLLOW sets for non-terminals A and B are

(i) FIRST(A) = {a, b, Ɛ} = FIRST(B)
FOLLOW(A) = {a, b} FOLLOW(B) = {a, b, $}

(ii) FIRST(A) = {a, b, $} FIRST(B) = {a, b, Ɛ}
FOLLOW(A) = {a, b} FOLLOW(B) = {$}

(iii) FIRST (A) = {a, b, Ɛ} = FIRST(B)
FOLLOW(A) = {a, b} FOLLOW(B) = {$}

(iv) FIRST (A) = {a, b} = FIRST(B)
FOLLOW(A) = {a, b} = FOLLOW(B)

18. The appropriate entries for E1, E2, and E3 in table given in question no. $7 **2**

(i) E1: S → a A b B ; A → S
E2: S → b A a B; B → S
E3: B → S

(ii) E1: S → a A b B; S → Ɛ
E2: S → b A a B; B → Ɛ
E3: S → Ɛ

(iii) E1: S → a A b B; S → Ɛ
E2: S → b A a B; S → Ɛ
E3: B → S

(iv) E1: S → Ɛ; A → S
E2: S → Ɛ; B → S
E3: B → S

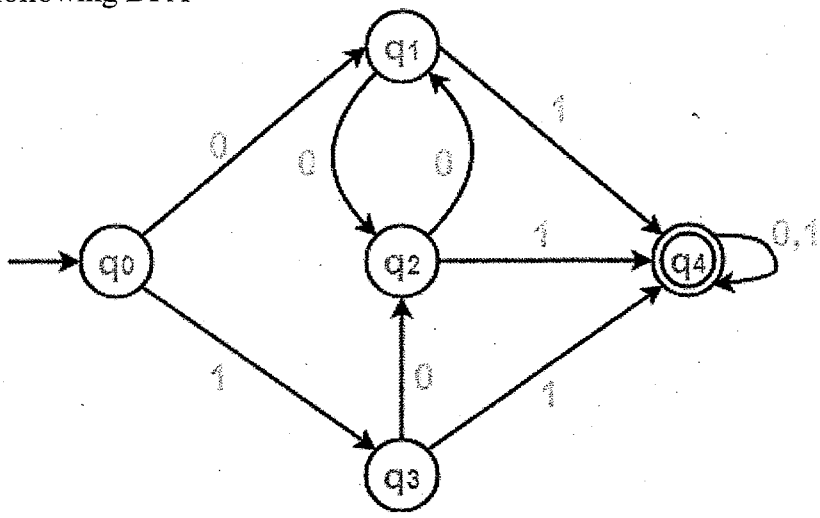
PART C □(4 x 5 = 20 Marks)

19. Explain how floating-point numbers are represented in SIC/XE.

20. Explain with suitable examples, and compare the following with reference to SIC and SIC/XE machines:
(i) Memory
(ii) Instruction format
(iii)Addressing Mode

21. Find a regular expression corresponding to each of the following subset {0,1}:
(i) The language of all strings containing at least two 0□s.
(ii) The language of all string containing at most two 0□s.
(iii) The language of all string ending with 1 and don□t contain 00.
(iv) The language of all strings in which both the number of 0□s and number of 1□s are odd.
(v) The language of all string in which every 0 is followed immediately by 11.

22. Minimize the given following DFA



PART D (1 x 20 = 20 Marks)

23. Consider the Following Grammar

S → A
A → a B | a C | A d | A e
B → b B c | f
C → g

(i) Construct all canonical collection sets for CLR/LR(1) parsing.
(ii) Construct CLR/LR(1) parsing table.
(iii) Construct all canonical collection sets for LALR parsing.
(iv) Construct LALR parsing table