Indian Institute of Information Technology, Vadodara
CS202 – System Software
B.Tech. (CSE) – IVth Semester
End - Semester Examination – May 2023

[Time – 3 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 – (15 x 1 = 15 Marks)

- **In each question only one correct answer is possible.**
- **For each correct answer 1 marks will be given, and for each wrong answer 0.25 marks will be deducted.**

1. The linker is
   (A). same as loader
   (B). always used before programs are executed
   (C). required to create a load module
   (D). None of these

2. In a two-pass assembler the object code generation is done during the?
   (A). Second Pass
   (B). First Pass
   (C). In both Pass
   (D). Not done by assembler

3. Which of the following system software resides in main memory always?
   (A). Text Editor
   (B). Assembler
   (C). Linker
   (D). Loader

4. In which addressing mode the operand is given explicitly in the instruction?
   (A). Absolute mode
   (B). Immediate mode
   (C). Indirect mode
   (D). Index mode

5. Translator for low level programming language were termed as
   (A). Assembler
   (B). Compiler
   (C). Linker
   (D). Loader

6. Analysis which determines the meaning of a statement once its grammatical structure becomes known is termed as
   (A). Semantic Analysis
   (B). Syntax Analysis
   (C). Regular analysis
   (D). General Analysis

7. The syntax of the assembler directive EQU is
   (A). EQU <address space>
   (B). <symbol>EQU<address space>
   (C). <symbol>EQU
   (D). None of these

8. Memory utilization factor shall be computed as follows
   (A). Memory in use/allocated memory.
   (B). Memory in use/total memory connected.
   (C). Memory allocated/free existing memory.
   (D). Memory committed/total memory available.

9. In a two-pass assembler, the task of the Pass II is to
   (A). Separate the symbol, mnemonic opcode and operand fields.
   (B). Build the symbol table.
   (C). Construct intermediate code.
   (D). Synthesize the target program.

10. A linker program
   (A). places the program in the memory for the purpose of execution
   (B). relocates the program to execute from the specific memory area allocated to it.
   (C). links the program with other programs needed for its execution
   (D). interfaces the program with the entities generating its input data.

11. Which of these is not a part of synthesis phase
   (A). Obtain machine code corresponding to the mnemonic from the Mnemonics table
   (B). Obtain address of a memory operand from the symbol table
   (C). Perform LC processing
   (D). Synthesize a machine instruction or the machine form of a constant

12. A macro definition consists of
   (A). A macro prototype statement
   (B). one or more model statements
   (C). Macro pre-processor statements
   (D). All of the above

13. Relocation bits used by replacing loader are specified by
   (A). Relocating loader itself
   (B). Assembler or Translator
   (C). Macro processor
   (D). Both (A) and (B)

14. Relocatable programs
   (A). cannot be used with fixed partition
   (B). can be loaded almost anywhere in memory
   (C). do not need a linker
   (D). can be loaded only at one specific location

15. Which of the following statements is not true?
   (A). Every language defined by any of the automata is also defined by a regular expression
   (B). Every language defined by a regular expression can be represented using a DFA
   (C). Every language defined by a regular expression can be represented using NFA with e moves
   (D). Regular expression is just another representation for any automata definition

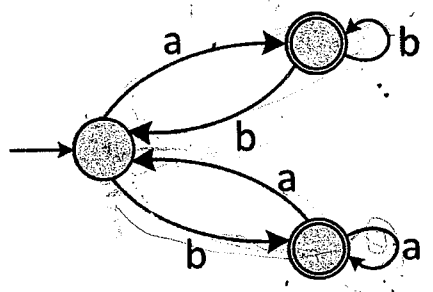
PART B – (5 x 2 = 10 Marks)

- **In each question maybe more than one correct answer is possible.**
- **In this section no negative marking, and for each correct answer 2 marks will be given.**

16. Consider L = {ab,aa,baa}, Which of the following string is NOT in L^*?

(A). baaaaabaaaaa (B). abaabaaabaa
(C). aaaabaaaa (D). baaaaabaa

17. Which one of the following regular expressions correctly represents the language of the finite automation given below?



(A). $ab^*bab^*+ba^*aba^*$ (B). $(ab^*b)^*ab^*+(ba^*a)^*ba^*$
(C). $(ab^*b+ba^*a)^*(a^*+b^*)$ (D). $(ba^*a+ab^*b)^*(ab^*+ba^*)$

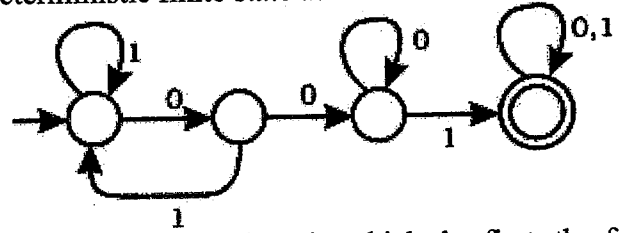
18. Consider the augmented grammar given below

$S' \rightarrow S$
$S \rightarrow \langle L \rangle \mid id$
$L \rightarrow L,S \mid S$

Let I_0 = CLOSURE ({[S' → •S]}). The number of items in the set GOTO (I0 , ⟨) is: _____.

(A). 5 (B). 6 (C). 7 (D). 8

19. Consider the following deterministic finite state automation M.



Let S denote the set of seven bit binary strings in which the first, the fourth, and the last bits are 1. The number of strings in S that are accepted by M is

(A). 1 (B). 5 (C). 7 (D). 8

20. Which one of the following grammars is free from left recursion?

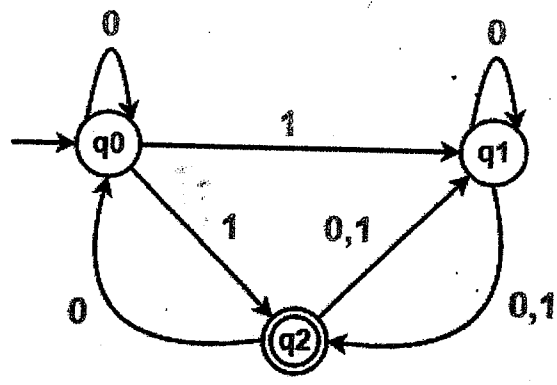
(A). $S \rightarrow AB$, $A \rightarrow Aa|b$, $B \rightarrow c$
(B). $S \rightarrow AB|Bb|c$, $A \rightarrow Bd|\varepsilon$, $B \rightarrow e$
(C). $S \rightarrow AB|B$, $A \rightarrow Bd|Sc|\varepsilon$, $B \rightarrow d$
(D). $S \rightarrow AB|Bb|c$, $A \rightarrow Bd|\varepsilon$, $B \rightarrow Ae|\varepsilon$

PART C - [35 Marks]

21. Briefly Describe the format of object program generated by SIC Assembler.
[3 Marks]

22. Why static libraries are attached to a program via the linker while the shared libraries are attached by the loader
[3 Marks]

23. Convert the following Non-Deterministic Finite Automata to Deterministic Finite Automata
[3 Marks]



24. What are the uses of OPTAB and SYMTAB during the assembling process? Specify the uses of each during pass 1 and pass 2 of two pass assembler.
[4 Marks]

25. What are control sections? Illustrate with an example. How control sections are used and linked in an assembly language program.
[4 Marks]

26. What are the data structures required for a microprocessor algorithm? Explain the format of each. How are Local labels handled in macro processing?
[4 Marks]

27. What are the basic functions of a loader? Give an algorithm and explain the working of an absolute loader?
[4 Marks]

28. Explain in detail the process of compilation. Develop the output of each phase of the compilation for the input ***(A=B*C +D/E)***
[5 Marks]

29. Write a macro to compare between two numbers and determine the maximum. Use it for Determine maximum of 10 numbers
[5 Marks]

--------- * * * * * ---------