

**Pune Vidyarthi Griha's  
College of Science & Technology**

**Regular Examination October 2021  
S.Y.B.Sc (C.S.) SEMESTER-III  
SAMPLE PAPER (Theory of Computation)**

**Note: 1. Attempt all Questions**

**Total: 50 Marks**

**2. Each correct question Carry 1 marks**

**1 hour**

1. A type 1 grammar is also called \_\_\_\_\_.
  - a) context dependent
  - b) natural language
  - c) context free
  - d) regular grammar
  
2. During the representation of mealy machine where do we specify the output?
  - a) On Transition Edge
  - b) On Transition Edge along with input
  - c) Inside Each State
  - d) Inside Each State with input
  
3. During the representation of moore machine where do we specify the output ?
  - a. Inside Each State with input
  - b. Inside Each State
  - c. On Transition Edge
  - d. On Transition Edge along with input
  
4. Which rule is correct for Equivalent FA ? (Note: IS = Intermedia State , FS= Final State)
  - a) IS-IS, FS-FS
  - b) IS-FS, IS-FS
  - c) FS-IS, FS-IS
  - d) IS-FS, FS-IS
  
5. How many number of states are required to accept the string that ends with 00 over the  $\Sigma = \{0,1\}$  ?
  - a) 1
  - b) 2

c) 3

d) 4

6. How many number of stacks are required by finite Automata ?
- a) 1
  - b) 0
  - c) 3
  - d) 2
7. \_\_\_\_\_ model is used to model the regular expression ?
- a) Moore Machine
  - b) Mealy Machine
  - c) DFA
  - d) NDFFA
8. In Finite Automata, the final State is also called as \_\_\_\_\_ State.
- a) Goal
  - b) Destination
  - c) Accepting
  - d) Finish
9. In Finite Automata, the start State is also called as \_\_\_\_\_ State.
- a) Initial
  - b) Beginning
  - c) Go
  - d) Ground Zero
10. The Output of Moore Machine Depends only on \_\_\_\_\_
- a) States of the Machines
  - b) Input
  - c) Input as well as State
  - d) State as well as on the input at any instant of time
11. When the moves of the machine cannot be determined uniquely by the input symbol and the present state, such an automation is called \_\_\_\_\_ automation.
- a) Push Down
  - b) Linear Bound
  - c) Deterministic
  - d) Non Deterministic
12. Empty String (a) has \_\_\_\_\_ length.
- (a) Zero
  - (b) One

(c) Double

(d) Cannot Determine

13. Write the regular expression to denote the language  $L$  over  $\Sigma = \{a, b\}$  such that all the strings do not contain the substring "ab".

- a)  $a^*b^*$
- b)  $b^*a^*$
- c)  $(ab)^*$
- d)  $(ba)^*$

14. The set of all strings of 0s and 1s ending in 00 can be described by the regular expression \_\_\_\_\_.

- a)  $(01)^*00$
- b)  $01^*00$
- c)  $(0+1)^*00$
- d)  $(0+1)^*(00)^*$

15. The set  $\{\epsilon, 0, 00, 000, \dots\}$  can also be represented by \_\_\_\_\_

- a)  $0^*$
- b)  $0 + \epsilon$
- c)  $\epsilon + 0$
- d)  $0^* + 0$

16. The set of all strings over input set  $\{0, 1\}$  in which all strings that begin and ends with 0 is \_\_\_\_\_

- a)  $0.(0+1)^*.1 + 1.(0+1)^*0$
- b)  $0.(0+1)^*.0$
- c)  $1.(0+1)^*0 + 0.(0+1)^*.1$
- d)  $0.(0+1)^* + (0+1)^*0$

17. \_\_\_\_\_ is used to show that certain sets are not regular.

- a) LBA
- b) TM
- c) Pumping Lemma
- d) PDA

18. The set  $\{a^n . b^n \mid n=1, 2, 3, \dots\}$  can be generated by CFG \_\_\_\_\_

- a)  $S \rightarrow ab \mid aSb$
- b)  $S \rightarrow a \mid aSb$
- c)  $S \rightarrow ab \mid aSb \mid \epsilon$
- d)  $S \rightarrow ab$

19. The CFG  $S \rightarrow aS \mid bS \mid a \mid b$  is equivalent to regular expression

- a)  $(a+b)$
- b)  $(a+b)(a+b)^*$
- c)  $(a+b)(a+b)$
- d)  $(a+b)^*$

20. Any String of terminals that can be generated by the following CFG is

$S \rightarrow XY, X \rightarrow aX \mid bX \mid a, Y \rightarrow Ya \mid Yb \mid a$  is \_\_\_\_\_

- a) has atleast one 'b'
- b) should end in a 'a'
- c) has no consecutive a's or b's
- d) has atleast two a's

21. Which of the following does not belong to context free grammar ?

- a) Non-Terminal Symbol
- b) Terminal Symbol
- c) Start Symbol
- d) End Symbol

22. Which of the following is format of unit production ?

- a)  $A \rightarrow B$
- b)  $A \rightarrow a$
- c)  $A \rightarrow$
- d)  $A \rightarrow \epsilon$

A. Context free grammar G is in Chomsky normal form if every production is of the form

- 
- a)  $A \rightarrow BC \mid A$
  - b)  $A \rightarrow BC \mid a$
  - c)  $A \rightarrow BCa, B \rightarrow b$
  - d)  $A \rightarrow BCa, C \rightarrow b$

24. A derivation tree is also called \_\_\_\_\_

- a) null tree
- b) binary tree
- c) acyclic graph
- d) parse tree

25. Grammar consist of \_\_\_\_\_ tuples

- a) 2
- b) 3
- c) 4
- d) 5

26. \_\_\_\_\_ is a combination of finite state machine and a stack

- a) PDA
- b) LBA
- c) Turing Machine
- d) Finite Automata

27. Write the transition function for : While being on state  $q_0$ , if input 'a' is occurred and 'R' is at the top of stack then move to state  $q_1$  by pushing 'X' above 'R' in the stack.

- a)  $\sigma(q_0, a, R) = \{(q_1, X)\}$
- b)  $\sigma(q_0, a, R) = \{(q_1, XX)\}$
- c)  $\sigma(q_0, a, X) = \{(q_1, XX)\}$
- d)  $\sigma(q_0, a, R) = \{(q_1, XR)\}$

28. The Symbol  $Z_0$  used in PDA represents \_\_\_\_\_

- a) terminal symbol
- b) initial stack symbol
- c) start symbol
- d) final state

29. If the PDA does not stop on accepting state and the stack is not empty, the string is \_\_\_\_\_

- a) is kept on hold
- b) goes into loop forever
- c) rejected
- d) accepted

30. Write the transition function for : While being on state  $q_0$ , if input 'a' is occurred and 'X' is at the top of stack then move to state  $q_1$  by popping 'X' from the top of stack

- a)  $\sigma(q_0, a, R) = \{(q_1, XR)\}$
- b)  $\sigma(q_0, a, X) = \{(q_1, \epsilon)\}$
- c)  $\sigma(q_0, a, R) = \{(q_1, \epsilon)\}$
- d)  $\sigma(q_0, a, R) = \{(q_1, X)\}$

31. PDA consist of \_\_\_\_\_ tuples.

- a) 7
- b) 6
- c) 5
- d) 4

32. If  $L_1$  and  $L_2$  are context free language and  $R$  a regular set, then which one of the languages below is not necessarily a context free language?

- (a)  $L_1 L_2$
- (b)  $L_1 \cap L_2$
- (c)  $L_1 \cap R$
- (d)  $L_1 \cup L_2$

33. Which of the following regular expression identity is true?

- (a)  $r(*) = r^*$
- (b)  $(r^*s^*)^* = (r + s)^*$
- (c)  $(r + s)^* = r^* + s^*$
- (d)  $r^*s^* = r^* + s^*$

34. The logic of pumping lemma is a good example of

- (a) Pigeon-hole principle
- (b) Divide-and-conquer technique
- (c) Recursion
- (d) Iteration

35. What is the highest type number which can be applied to the following grammar?

$S \rightarrow Aa, A \rightarrow Ba, B \rightarrow abc$

- (a) Type 0
- (b) Type 1
- (c) Type 2
- (d) Type 3

36. The set of all strings over the alphabet  $S = \{a, b\}$  (including  $\epsilon$ ) is denoted by

- (a)  $(a + b)^*$
- (b)  $(a + b)^+$
- (c)  $a+b^+$

(d)  $a^*b^*$

37. Which of the following strings is not generated by the following grammar?  $S \rightarrow SaSbS \mid e$

(a) aabb

(b) abab

(c) aababb

(d) aaabb

38. The defining language for developing a formalism in which language definitions can be stated, is called

(a) Syntactic meta language

(b) Decidable language

(c) Intermediate language

(d) High level language

39. Consider the following language,

$$L = \{anbn \mid n = 1\}$$

L is?

(a) CFL but not regular

(b) CSL but not CFL

(c) Regular

(d) Type 0 language but not type 1

40. A language L is accepted by a FSA if it is

(a) CFL

(b) CSL

(c) Recursive

(d) Regular

41. Which one of the following statement is FALSE?

(a) Context-free languages are closed under union

(b) Context-free languages are closed under concatenation

(c) Context-free languages are closed under intersection

(d) Context-free languages are closed under Keene closure

43. Correct hierarchical relationship among context-free, right-linear, and context-sensitive language is

- (a) Context-free  $\subset$  right-linear  $\subset$  context-sensitive
- (b) Context-free  $\subset$  context-sensitive  $\subset$  right-linear
- (c) Context-sensitive  $\subset$  right-linear  $\subset$  context-free
- (d) Right-linear  $\subset$  context-free  $\subset$  context-

sensitive 44. Consider the following language,

$$L = \{anbncndn \mid n = 1\}$$

L is?

- (a) CFL but not regular
- (b) CSL but not CFL
- (c) Regular
- (d) Type 0 language but not type 1

45. Recursive languages are

- (a) A proper superset of CFL
- (b) Always recognized by PDA
- (c) Are also called type 0 languages
- (d) Always recognized by FSA

46. Consider the following

$$\text{grammar } S \rightarrow Ax / By$$

$$A \rightarrow By / Cw$$

$$B \rightarrow x / Bw$$

$$C \rightarrow y$$

47. Which of the regular expressions describe the same set of strings as the grammar?

- (a)  $xw^*y + xw^*yx + ywx$
- (b)  $xwy + xw^*xy + ywx$
- (c)  $xw^*y + xwx + ywx$
- (d)  $xwxy + xww^*y + ywx$

48. The language  $L = \{0^n 1^n \mid n > 0\}$  is a

- (a) Context free language

(b) Context-sensitive language

(c) Regular language

(d) Recursive enumerable

language 49.  $baa^*c$  denotes the set

(a)  $\{b^m a^n c^p \mid n, m, p = 1\}$

(b)  $\{b^n a^n c \mid n = 0\}$

(c)  $\{b^n a^n c \mid n = 1\}$

(d)  $\{w \mid w \text{ is a string of } a, b, c\}$

50. P, Q, R are three languages, if P and R are regular and if  $PQ = R$ , then

(a) Q has to be regular

(b) Q cannot be regular

(c) Q need not be regular

(d) Q cannot be a CFL