SG – 631

VI Semester B.C.A. Examination, September/October 2021
(CBCS Scheme) (Fresh + Repeaters) (2016-17 and Onwards)
COMPUTER SCIENCE
BCA 601 : Theory of Computation

Time : 3 Hours

Max. Marks : 100

Instruction : *Answer* ***all*** *Sections.*

SECTION – A

Answer **any ten** questions. **Each** question carries **two** marks : **(10×2=20)**

1. Define a symbol and an alphabet with example.
2. Write the five tuple of a Finite Automata.
3. Define E-closure.
4. Write the regular expression for the set of strings of 0's and 1's starting with 01.
5. Define regular expression.
6. Find the language accepted by the following grammar G = (V, T, P, S) where V = {S}, T = {a}, S = {S} and P = {S $\rightarrow$ aS / $\in$}.
7. Define Parse Tree.
8. Define GNF.
9. What is Left Recursion ?
10. Define Nullable variable.
11. List out any two closure properties of recursive language.
12. Define post correspondence problem.

P.T.O.

SECTION – B

Answer **any five** questions. **Each** question carries **five** marks : **(5×5=25)**

13. Differentiate between DFA and NFA.

14. Design a DFA to accept strings which ends with 110 where $\Sigma = \{0, 1\}$ and check whether the string 0110 is accepted by the DFA.

15. Show that $L = \{\omega\omega^R / \omega \in (a + b)^*\}$ is not regular.

16. Construct an $\in$-NFA for the following regular expression $(0 + 1)^* 1 (0 + 1)$.

17. Check whether the following grammar is ambiguous.

    $S \to i C t S / i C t S e S / a$

    $C \to b$.

18. Convert the following grammar into CNF

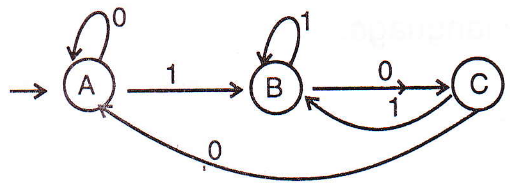
    $S \to a A D$

    $A \to a B / b A B$

    $B \to b$

    $D \to d$.

19. Obtain a grammar for the following DFA.



20. Write a note on different types of turing machines.

SECTION – C

Answer **any three** questions. **Each** question carries **fifteen** marks : (3×15=45)

21. Convert the following NFA to its equivalent DFA.

S_D	0	1
$\rightarrow q_0$	$\{q_0, q_1\}$	$\{q_0\}$
q_1	$\{q_2\}$	$\{q_2\}$
q_2	$\{q_3\}$	ϕ
$* q_3$	$\{q_3\}$	$\{q_3\}$

22. Minimize the following DFA

	a	b
→ A	B	E
B	C	F
* C	D	H
D	E	H
E	F	I
* F	G	B
G	H	B
H	I	C
* I	A	E

23. Construct a PDA to accept the language $L = \{a^n b^n \mid n \geq 1\}$ and check whether the strings aaabbb and aaba are accepted by the PDA.

24. a) Eliminate useless symbols from the following grammar 8

$S \rightarrow aA / a / Bb / cC$

$A \rightarrow aB$

$B \rightarrow a / Aa.$

$C \rightarrow cCD$

$D \rightarrow ddd.$

b) Eliminate unit productions from the following grammar. **7**

$S \rightarrow A\,a / B / C\,a$

$B \rightarrow a\,B / b$

$C \rightarrow D\,b / D$

$D \rightarrow E / d$

$E \rightarrow a\,b.$

25. Design a Turing Machine to accept the language $L = \{0^n\, 1^n / n \;\geq\}$.

SECTION – D

Answer **any one** question : **(1×10=10)**

26. State and prove pumping lemma for regular expressions.

27. Explain with examples different types of grammar.

____