

PART – B

(5 x 13 = 65 Marks)

- | Q.No. | Questions | Marks | KL | CO | | | | | | | | | | | | | | | | | | |
|------------|---|------------|----|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|
| 11. a) | Construct NFA accepting the set of strings $\Sigma = \{0,1\}$ such that two 0's are separated by a sting whose length is $4i$, for some $i \geq 0$. | 13 | K2 | CO1 | | | | | | | | | | | | | | | | | | |
| | (OR) | | | | | | | | | | | | | | | | | | | | | |
| b) | Prove that for every L is recognized by an NFA, there exist an equivalent DFA accepting the same language L. | 13 | K2 | CO1 | | | | | | | | | | | | | | | | | | |
| 12. a) | Draw a Deterministic Finite Automata recognizing the language corresponding to the regular expression $(a+bca^*)^*$. Test your DFA using any two strings of the Language. | 13 | K3 | CO2 | | | | | | | | | | | | | | | | | | |
| | (OR) | | | | | | | | | | | | | | | | | | | | | |
| b) | Minimize the following DFA. (if possible) | 13 | K3 | CO2 | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Sate/Input</th> <th>a</th> <th>b</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>2</td> <td>3</td> <td>5</td> </tr> <tr> <td>3</td> <td>4</td> <td>3</td> </tr> <tr> <td>4</td> <td>3</td> <td>5</td> </tr> <tr> <td>5</td> <td>2</td> <td>5</td> </tr> </tbody> </table> | Sate/Input | a | b | 1 | 2 | 3 | 2 | 3 | 5 | 3 | 4 | 3 | 4 | 3 | 5 | 5 | 2 | 5 | | | |
| Sate/Input | a | b | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | | | | | | | | | | | | | | | | | | | | |
| 2 | 3 | 5 | | | | | | | | | | | | | | | | | | | | |
| 3 | 4 | 3 | | | | | | | | | | | | | | | | | | | | |
| 4 | 3 | 5 | | | | | | | | | | | | | | | | | | | | |
| 5 | 2 | 5 | | | | | | | | | | | | | | | | | | | | |
| 13. a) | Examine whether the language $L = \{ a^n b^p c^n d^{2p} \mid n > 0 \}$ can be designed using Pushdown automation. Justify your answer. | 13 | K4 | CO3 | | | | | | | | | | | | | | | | | | |
| | (OR) | | | | | | | | | | | | | | | | | | | | | |
| b) i. | Show using pumping lemma that the given language is not a CFL $L = \{ a^n b^{2n} a^n \mid n \geq 0 \}$. | 7 | K3 | CO3 | | | | | | | | | | | | | | | | | | |
| ii. | Discuss the equivalence between PDA and CFG. | 6 | | | | | | | | | | | | | | | | | | | | |
| 14. a) | Convert the following grammar to Chomsky Normal form.
$S \rightarrow A AB0 A1A$
$A \rightarrow A0 \epsilon$
$B \rightarrow B1 BC$
$C \rightarrow CB CA 1B$ | 13 | K3 | CO4 | | | | | | | | | | | | | | | | | | |
| | (OR) | | | | | | | | | | | | | | | | | | | | | |
| b) | Design a turing machine to perform the following function,
$f(x) = 2x+2, x > 0$. | 13 | K3 | CO4 | | | | | | | | | | | | | | | | | | |
| 15. a) i. | If L_1 and L_2 are recursive language then $L_1 \cup L_2$ is a recursive language. | 5 | K3 | CO5 | | | | | | | | | | | | | | | | | | |
| ii. | Prove that the halting problem is undecidable. | 8 | | | | | | | | | | | | | | | | | | | | |

(OR)

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|----|-----|--|---|----|-----|
| b) | i. | State and prove the post's correspondence problem. | 8 | K2 | CO5 |
| | ii. | Write a note on NP problems. | 5 | | |

PART – C

(1 x 15 = 15Marks)

- | Q.No. | Questions | Marks | KL | CO |
|--------|--|-------|----|-----|
| 16. a) | State and prove that "Diagonalization language is not recursively enumerable". | 15 | K3 | CO5 |

(OR)

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|----|-------------------------------------|----|----|-----|
| b) | Convert the following CFG into GNF. | 15 | K3 | CO4 |
|----|-------------------------------------|----|----|-----|
- S → XA | BB
B → b | SB
X → b
A → a
-