

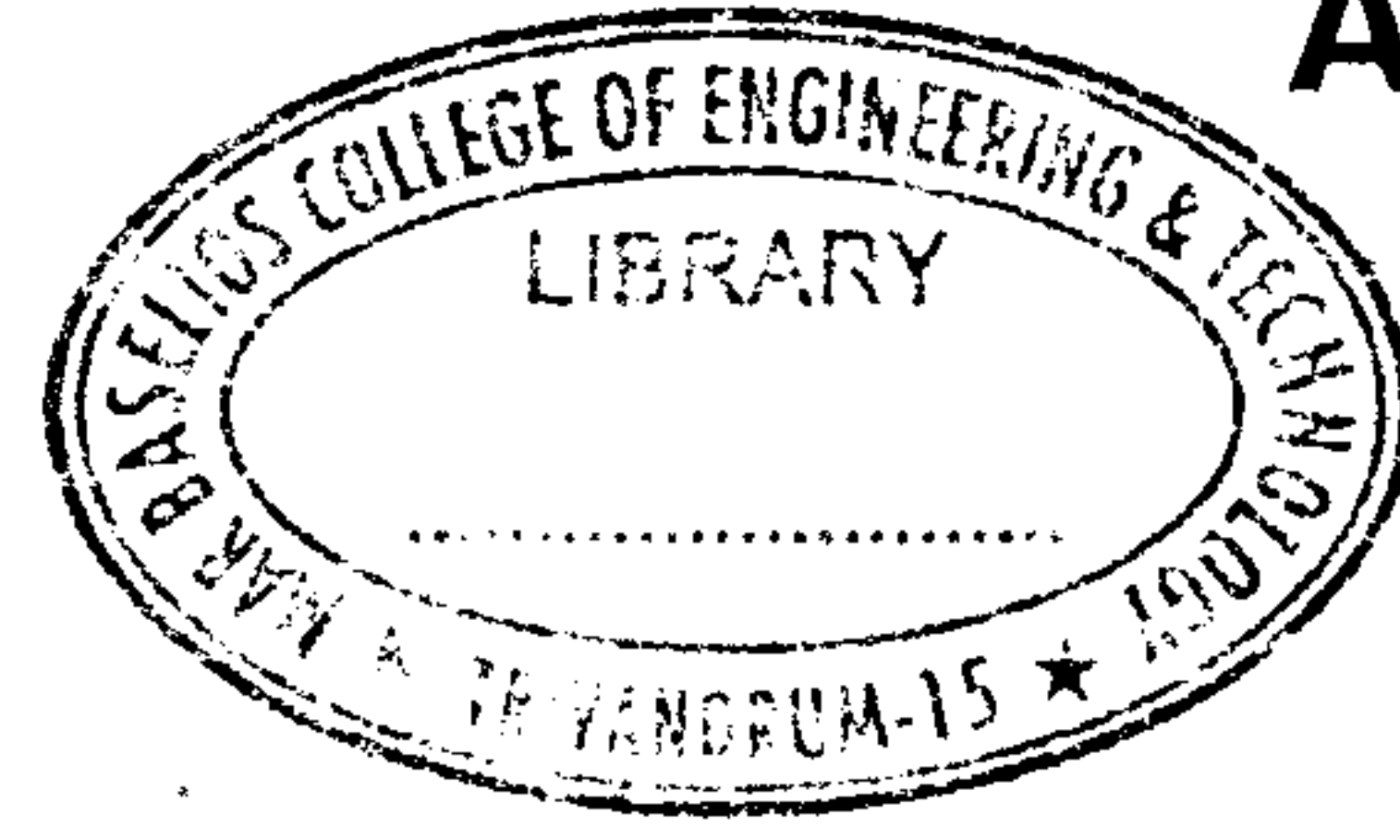


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A – 6441

Reg. No. :

Name :



**Fifth Semester B.Tech. Degree Examination, September 2016
(2008 Scheme)**

08.503 : THEORY OF COMPUTATION (F)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer all questions.

1. Are DCFLs closed under complementation operation ? Why ?
2. Construct a DFA accepting $L_1 = \{a^n b^m c^p / n \geq 0, m \geq 0, p > 0\}$.
3. Design a FA for $L_2 = \{w \text{ is binary}/w \text{ does not contain } 0110, \text{ contains } 101\}$.
4. When is a CFG considered ambiguous ? Give an example.
5. Is $L_1 = \{x / x \text{ in } L, L \text{ is regular and no proper prefix of } x \text{ is in } L\}$ regular ? Why ?
6. Is it possible to check whether two DFAs are equivalent ? Why ?
7. State and explain Rice's theorem.
8. Given L is a CFL. Is L^R a CFL ? Why ?
9. What is meant by 'Universal Turing Machine' ?
10. Show that recursive sets are closed under union and complementation.

(10×4=40 Marks)

P.T.O.



PART – B

Answer **any one** question from **each** Module.

Module – I

11. a) Construct a finite automaton for the following grammar.
- i) $S \rightarrow abS_1$ $S_1 \rightarrow abS_1/S_2$ $S_2 \rightarrow a$
- ii) $S \rightarrow abA$ $A \rightarrow baB$ $B \rightarrow aA/bb$ 10
- b) Using Myhill-Nerode theorem, show that $\{0^i1^j \mid \gcd(i, j) = 1\}$ is not regular. 10
12. a) Design an NFA which accepts all binary strings in which the fourth symbol from the end is 0. 6
- b) Convert the above NFA to an equivalent DFA by subset construction method. 7
- c) Minimize the DFA obtained in the previous step. 7

Module – II

13. a) Given $L_1 = \{w \text{ is binary} \mid w \text{ contains equal number of Os and Is}\}$. Is L_1 a CFL? If so, write the CFG that generates it. Otherwise, using pumping lemma, show that L_1 is not a CFL. 10
- b) State and prove the pumping lemma for CFLs. 10
14. a) Construct a PDA for a CFG with the following productions.
- $S \rightarrow aSA \mid aAA \mid b$ $A \rightarrow bBBB$ $B \rightarrow b$ 12
- b) Explain Chomsky classification of languages. 8

Module – III

15. a) Prove that the Halting problem is undecidable. 8
- b) Design a Turing machine which converts a unary number to binary. 12
16. a) Design a Turing machine which for $L = \{0^m1^n \mid m < n\}$ 10
- b) Show that a multi-tape Turing machine can be simulated by a single-tape Turing machine. 10

(3×20=60 Marks)

