

**BACHELOR OF COMPUTER APPLICATIONS  
(BCA) (Pre-Revised)**

**Term-End Examination**

**December, 2016**

02025

**CS-73 : THEORY OF COMPUTER SCIENCE**

*Time : 3 hours*

*Maximum Marks : 75*

**Note :** *Question number 1 is compulsory. Attempt any three questions from the rest.*

1. (a) Design a Mealy Machine accepting the language consisting of strings from  $\Sigma^*$ , where  $\Sigma = \{0, 1\}$  and ending with double zero's or double one's. 5
- (b) Determine FA if  $\Sigma = \{a, b\}$  for
- (i) Language generated
- $$L_A = (ab)^* = \{ (ab)^n \mid n \geq 0 \}$$
- (ii) Language generated
- $$L_B = \{ (ab)^n \mid n \geq 1 \}$$
- 6
- (c) Prove that if  $L_1$  and  $L_2$  are context-free languages, then  $L_1 \cup L_2$  is a context-free language. 5

- (d) Design a PDA that accepts a language of the form  $L = \{a^n b^{3n} : n \geq 1\}$  by empty store. 8
- (e) Explain Non-Deterministic Turing Machine with example. 6
2. (a) Prove the  $L = \{a^n b^k : n > k, \text{ and } n \geq 0\}$  is not regular. 5
- (b) Prove that if  $L$  is a CFL, then  $L^*$  is a CFL. 5
- (c) When do you say a CFG is ambiguous ? Show that the grammar  $G$  with productions
- $$S \rightarrow a \mid aAb \mid abSb$$
- $$A \rightarrow aAAb \mid bS$$
- is ambiguous. 5
3. (a) Reduce the given CFG with productions given by
- $$S \rightarrow abSb \mid a \mid aAb$$
- $$A \rightarrow bS \mid aAAb$$
- to Chomsky Normal Form (CNF). 10
- (b) Write a short note on Universal Turing Machine. 5

4. (a) Design a Turing Machine  $M$  to accept the language  $L = \{0^n 1^n : n \geq 1\}$  and compute 0011. 10
- (b) What are Left-Linear and Right-Linear grammars? Explain. 5
5. (a) What is PCP? Explain with example. 5
- (b) Discuss in detail all the asymptotic notations with examples. 10
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