

**T.Y.B.SC. (COMPUTER SCIENCE) SEM –V (2014 COURSE) :**  
**WINTER - 2017**  
**SUBJECT: THEORETICAL COMPUTER SCIENCE**

**Day: Friday**  
**Date: 03/11/2017**

**Time: 03.00 PM TO 05.00 PM**  
**Max. Marks: 40**

**W-2017-0760**

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**N.B:**

- 1) All questions are **COMPULSORY**.
  - 2) Figures to the right indicate **FULL** marks.
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**Q.1** Attempt **ANY TWO** of the following: **(10)**

- a) Construct DFA to accept set of all strings ending with 'p' and having substring 'pqr' over  $\Sigma = \{p, q, r\}$ .
- b) What is NFA? Construct NFA for language which accepts all strings having 'ab' as a substring over,  $\Sigma = \{a, b\}$ .
- c) Explain Chomsky grammar hierarchy.

**Q.2** Attempt **ANY TWO** of the following: **(10)**

- a) Convert following Context Free Grammar into Chomsky Normal Form  
 $S \rightarrow aAb \mid Aba$   
 $A \rightarrow aS \mid bB$   
 $B \rightarrow ASb \mid a$
- b) Construct Melay machine that outputs 'V' for valid and 'I' for invalid for language  $L = (a+b)^* b$ .
- c) Prove that the class of regular sets is closed under union and intersection.

**Q.3** Attempt **ANY TWO** of the following: **(10)**

- a) Write a note on Push Down Automata.
- b) What is derivation tree? Explain with example.
- c) What is meant by ambiguous grammar? Explain how to remove ambiguity in the grammar.

**Q.4** Attempt **ANY FIVE** of the following: **(10)**

- a) What is rightmost derivation?
- b) Define Turing machine.
- c) Define finite automata.
- d) What is pumping lemma?
- e) Construct Deterministic finite automata for  $L = \{\emptyset\}$
- f) What is halting problem?
- g) Write properties of regular languages.

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