VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Continuous Assessment Test-II, Fall Semester 2020-2021

CSI1003- Formal Languages and Automata Theory

Slot: C2 **Exam Duration: 45 Minutes** **Maximum Marks: 30**

1.Convert the context free grammar into GNF, (12 marks)

$S \rightarrow XY \mid W$
$X \rightarrow aXb \mid \varepsilon$
$Y \rightarrow cY \mid \varepsilon$
$W \rightarrow aWc \mid Z$
$Z \rightarrow bZ \mid \varepsilon$

S is the start Symbol and non-terminals are $\{S, X, Y, W, Z\}$

2.

Consider the following grammar, (10 marks)

<S> → <NP><VP>
<NP> → <A><N> | <A><AN>
<AN> →<AJ><N>
<VP> → <V> | <V><NP>
<A> → a | the
<N> → girl | boy | cat
<AJ>→ big | small | blue
<V> → sees | likes

Where
S - **<SENTENCE>**
NP - **<NOUN-PHRASE>**
VP - **<VERB-PHRASE>**
A - **<ARTICLE>**
N - **<NOUN>**
AN - **<ADJ_NOUN>**
AJ - **<ADJ>**
V - **<VERB>**

the start symbol is <**S**> and the non-terminals are enclosed with <… >Check the input string **boy likes the small cat** is a member of the given grammar using CYK algorithm

3. Find equivalent context free grammar for given context free language and also give two valid and invalid strings for the given language (3 marks)

$$L(G) = \{o^n w w^r o^n | n \geq 0, w \in \{a, b\}*\}$$

4. Prove that the Language 1 union Language 2 is regular (5 marks)

Language 1 All strings that contain an even number of b's. over the alphabet $\sum$ = {a, b}

Language 2.All strings which do not contain the substring ba over the alphabet $\sum$ = {a, b}