**GHANA COMMUNICATION TECHNOLOGY UNIVERSITY (GCTU), ACCRA**
**DEPARTMENT OF COMPUTER SCIENCE**
**M.SC. / M.PHIL. IN COMPUTER SCIENCE**
**CSSD 609 - THEORY OF COMPUTATION**
**RESEARCH ASSIGNMENT II**

**INSTRUCTIONS**: This is a group assignment (four in a group). Each group is required to conduct research on the topics below and present research results using the required .doc and .ppt templates. Both your Microsoft Word and PowerPoint files (18-20 slides) should be named "Group X.-CSSD 609-Research Assignment II, 2024-2025", where X should be replaced with your group number.

**GROUP ONE [THE CHURCH -TURING THESIS]**
➢ Turing machines (TMs)
➢ Turing machine variants

**GROUP TWO [THE CHURCH -TURING THESIS]**
➢ Universal Turing machines
➢ Church-Turing thesis

**GROUP THREE [THE CHURCH -TURING THESIS]**
➢ Halting problem and undecidability

**GROUP FOUR [DECIDABLE LANGUAGES]**
➢ Decision Problems
➢ Decidable languages

**GROUP FIVE [DECIDABLE LANGUAGES]**
➢ Decidable Problems Concerning Regular Languages
➢ Decidable Problems Concerning Context-Free Languages

**GROUP SIX [DECIDABLE LANGUAGES]**
➢ Undecidability
➢ The Diagonalization Method

**GROUP SEVEN [REDUCIBILITY]**
➢ Undecidable Problems from Language Theory
➢ Reductions Via Computation Histories.

**GROUP EIGHT [COMPLEXITY THEORY]**
➢ Complexity Theory
➢ Time and space complexity

**GROUP NINE [COMPLEXITY THEORY**
➢ P, NP, and NP-completeness

**GROUP TEN [COMPLEXITY THEORY]**

> ➢ Cook-Levin theorem

## GROUP ELEVEN [COMPLEXITY THEORY]
➢ PSPACE and other complexity classes

## GROUP TWELVE [COMPLEXITY THEORY]
➢ Approximation algorithms in theory of computation

## GROUP THIRTEEN [COMPUTABILITY THEORY]
➢ Introduction
➢ Turning Machine
➢ Context-free Languages

## GROUP FOURTEEN [COMPLEXITY THEORY]
➢ Pushdown Automata (PDA)
➢ Equivalence Between Context-free Grammars and PDAs

## GROUP FIFTEEN [COMPLEXITY THEORY]
➢ Closure Properties of Context Free Languages

**SUBMISSION PROCEDURE**: Kindly submit your three assignment files in a folder named "Group X-CSSD 609-Research Assignment II, 2024-2025", where X should be replaced with your group number to yawasabere2011@gmail.com (Cc: kuubooremarcellinus@gmail.com) by close of **24th May, 2025**. Presentations of research results will be done after submissions.