SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF COMPUTING
SUBJECT: THEORY OF COMPUTATION
ASSIGNMENT-II

PART A

1. Which one of the following statements is FALSE?
    a. There exist context-free languages such that all the context-free grammars generating them unambiguously.
    b. An unambiguous context-free grammar always has a unique parse tree for each string of the language generated by it.
    c. Both deterministic and non-deterministic pushdown automata always accept the same set of languages.
    d. A finite set of string from some alphabet is always a regular language.
2. The general form of the PDA transition function is ----------
3. Which of the following languages is accepted by a non-deterministic pushdown automaton (PDA) but NOT by a deterministic PDA?
    a. $\{a^n b^n c^n | n \geq 0\}$
    b. $\{a^l b^m c^n | l \neq m \text{ or } m \neq n\}$
    c. $\{a^n b^n | n \geq 0\}$
    d. $\{a^n b^n | m, n \geq 0\}$
4. Explain the variants of PDA with example.
5. Describe the Iinstantaneous Description(ID) of PDA.

PART B

1. Formally define pushdown automata.
2. Describe the advantages of pushdown automata over finite state machine.
3. Describe the different modes of PDA acceptance.
4. Construct deterministic pushdown automata that accept the following languages (only model)
    (i) $L= \{0^n 1^m 0^n \mid n \geq 1, m \geq 1\}$
    (ii) $L=\{a^n b^n c^m d^m \mid n,m>=1 \}$
5. Construct PDA corresponding the given Grammar
    $S \rightarrow aS| aSbS| \varepsilon.$
    Check whether the machine accepts the string ‘aab’ or not.

PART C

1. Answer the following:

a. Build a PDA to recognize $L = \{0^i 1^j 2^k | \ i + k = j\}$.
b. Use the pumping lemma to prove that the language $A = \{0^{2n}\ 1^{3n}\ 0^n \mid n \geq 0\ \}$ is not context free.