NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI
CYCLE TEST 2 – January 2021 Session

DEPARTMENT	:	Computer Science and Engineering
DATE & TIME OF EXAM	:	21st April 2021 & 10.00 am
SUB CODE	:	CSPC41 – Automata and Formal Languages
SEMESTER & YEAR	:	IV / II / A section
DURATION	:	1 hr
MARKS	**:**	**20 marks**

1. Construct a CFG to generate N(M) where M is given by M = ({p,q}, {0,1}, {X, Z}, δ, q, Z, Φ) and δ is defined by (7)
   δ(q, 1, Z) = (q, XZ)
   δ(q, 1, X) = (q, XX)
   δ(q, 0, X) = (p, X)
   δ(q, ε, Z) = (q, ε)
   δ(q, 1, X) = (p, ε)
   δ(q, 0, Z) = (q, Z)

2. Write a CFG for the language over {0,1} where the ratio of number of 1's to the number of 0's is three to two. Convert this grammar to a PDA using the theorem. (7)

3. Simplify the grammar to CNF with S as the start symbol: (2)
   S → eSe | GH
   G → cGb | ε
   H → JHd | ε
   J → bJ | f

4. Check if the following is ambiguous? (2)
   S → SS | a | b

5. Design a PDA such that $\{a^m b^n \mid n < m\}$ by empty stack. (2)

Best Wishes