Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech

Branch : EEE **Semester** : 5

Title of the Course : Power System Analysis **Course Code** : EEL 302

Time: 10:00-12:00noon **Maximum Marks: 25**

Note: ***Attempt all questions.*** **Mark**

Q. [1] State the advantages of per unit (p. u.) system. 2

Q. [2] What are the different types of buses in power systems? What are the quantities specified at each bus? 2

Q. [3] If the reactance in ohms is 15 ohms, find the p. u. value for a base of 15 KVA and 10 KV. 2

Q. [4] A single-phase two winding transformer is rated 20 kVA, 480/120 volts, 50 Hz. The equivalent leakage impedance of the transformer referred to the 120 volt winding, denoted winding 2, is $Z_{eq2} = 0.0525\angle 78.13^0 \Omega$. Using the transformer ratings as base values, determine the per-unit leakage impedance referred to winding 2 and referred to winding 1. 5

Q. [5] ***Figure A*** shows the one-line diagram of a simple three-bus power system with generation at buses 1 and 3. The voltage at bus 1 is $V_1 = 1.025\angle 0^0$. Voltage magnitude at bus 3 is fixed at 1.03 p.u. with a real power generation of 300 MW. A load consisting of 400 MW and 200 MVAR is taken from bus 2. Line impedances are marked in per unit on a 100 MVA base and line charging susceptances are neglected. Obtain the power flow solution by the Gauss-Seidel method up-to the first iteration only. Determine the line flows and line losses. Construct a power flow diagram showing the direction of line flow. 10

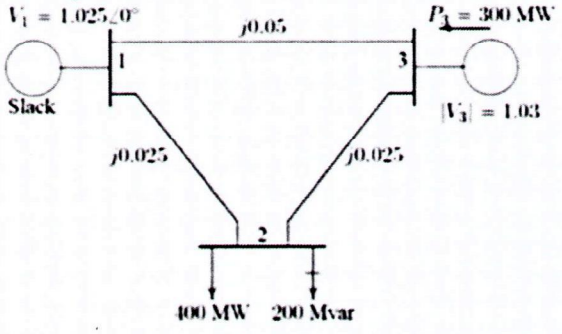

Figure: A

Q. [6] Make the Jacobian matrix for network shown in ***figure A***. What will be the matrix size of Jacobian and their sub-matrix J_1, J_2, J_3 and J_4? Also, write the step-wise solution procedure of power flow using Newton-Raphson method for ***figure A***. 4