Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015

Subject Code: 710701 **Date: 11/05/2015**

Subject Name: Power System Modeling & Simulation

Time: 10:30 am to 1:00 pm **Total Marks: 70**

Instructions:

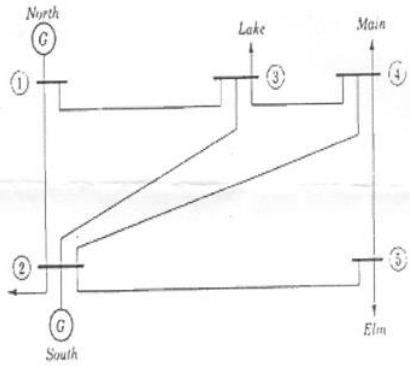
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 (a) Consider a system which has three buses and three lines, each bus is connected to another bus by a transmission line. The transmission line is modeled as series resistance R and series inductive reactance X in P. U. Form the Y bus for the system. Also give the modifications in Ybus when shunt branch is considered in each of the transmission line Assume suitable values when ever required. **07**

(b) Form the Y bus for the system shown in the Figure. Line impedances and charging admittances are given in the Table **07**

Table 8.2 Impedances and line charging for sample system

Bus code $p-q$	Impedance z_{pq}	Line charging $y'_{pq}/2$
1–2	$0.02 + j0.06$	$0.0 + j0.030$
1–3	$0.08 + j0.24$	$0.0 + j0.025$
2–3	$0.06 + j0.18$	$0.0 + j0.020$
2–4	$0.06 + j0.18$	$0.0 + j0.020$
2–5	$0.04 + j0.12$	$0.0 + j0.015$
3–4	$0.01 + j0.03$	$0.0 + j0.010$
4–5	$0.08 + j0.24$	$0.0 + j0.025$



Q.2 (a) What is Jacobin matrix used in N R method of load flow study? Consider a power system with total 2 buses. Out of which one of the bus is PV bus. Find the expression of all the sub matrices of Jacobian [J1, J2, J3 and J4] from the Static load flow equations. (Notations have usual meanings). **07**

(b) Compare GS method of load flow study with N R Method. **07**

OR

(b) Prove Ybus = A^T [y] A , using primitive admittance matrix 'y' and network topology **07**

Q.3 (a) What is meant by power system state estimation? Using weighted least squares technique derive an expression for 'n' number state variables in terms of 'm' number of measurements each of them having assigned typical weighting factor with usual notations and symbols. **07**

(b) What are the different dispatch policies? Explain secure and optimal dispatch with suitable example **07**

OR

Q.3	(a)	What are the constraints to be considered for contingency analysis? Using bus impedance matrix, derive expression for compensating currents' vector when two lines are added in existing power system between i-j buses and p-q buses respectively. Has any implication of Thevenin's theorem been found in the expression derived?	07
	(b)	What is power system security analysis? Explain different states of power system and state necessary controls to be provided at different level.	07
Q.4	(a)	What is L U factorization? Explain How L U factorization or triangular factorization method can be used to inverse a matrix.	07
	(b)	Explain Range-Kutta method for numerical integration with suitable example	07
		OR	
Q.4	(a)	Discuss effect of traveling waves on short circuited transmission line.	07
	(b)	State the importance of Slack bus in load flow study, also discuss which generator bus should be selected as slack bus and why?	07
Q.5	(a)	Explain Linear Sensitivity factors, Generation shift factor and line outage distribution factor for Power System Security.	07
	(b)	Compare backward Euler's method and trapezoidal method in context to application of these methods to the large scale power systems.	07
		OR	
Q.5	(a)	What is Network Observability and Pseudo measurements? Explain in detail	07
	(b)	For the purpose of stability analysis, the first order differential equation is derived and then solved using some numerical technique. Write the assumptions which are made while writing such equations.	07