

**GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. I<sup>ST</sup> Semester–Remedial Examination – July- 2011

Subject code: 710701

Subject Name: Power System Modelling and Simulation

Date:07/07/2011

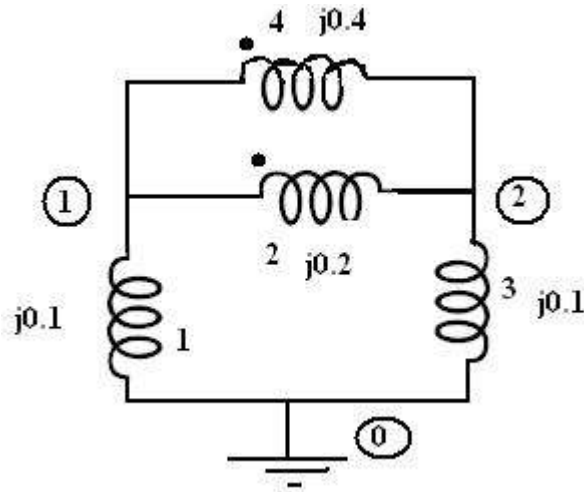
Time: 10:30 am – 01:00 pm

Total Marks: 60

**Instructions:**

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

- Q.1** (a) Define following network matrices : Basic incidence matrix (A), Basic Loop matrix (B), Basic cutset matrix (C) and Branch Path Incidence matrix (K). **06**
- (b) Derive following relations :  $Y_{bus} = A [y] A^T$ , using primitive admittance matrix 'y' and network topology. **06**
- Q.2** (a) How  $Z_{bus}$  algorithm is used to add Link in to the existing partial network. Derive all the equations used in the algorithm. The added element may be mutually coupled and may be connected to a reference node. **06**
- (b) For a given network, considering node-0 as reference node, find bus impedance matrix using  $Z_{bus}$  algorithm. Elements 2 & 4 are mutually coupled having mutual reactance  $j0.1$  per unit. Add elements as per order given by number shown in figure below. **06**

**OR**

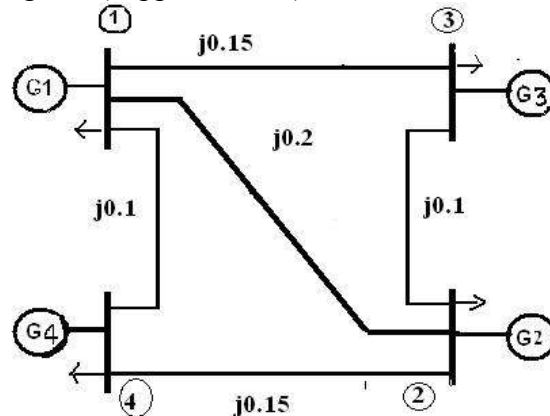
- (b) List all the assumptions made in short circuit (fault) analysis. And justify each of them. Also state applications of short circuit analysis. **06**
- Q.3** (a) Draw the flowchart for FDLF method for 'n' bus power system having both PV and PQ buses. State all assumptions made in decoupled load flow method to obtain FDLF algorithm. **06**
- (b) Write a short note on concept of 'optimal Power flow'. Explain 'Gradient method' OR 'Linear programming method' for optimal power flow. **06**

**OR**

- Q.3 (a)** Explain ‘Approximate load flow method’ or ‘Direct load flow method’ for ‘n’ bus system. State all the assumption made to derive equations and justify each of them. **06**
- (b)** Consider 4 bus system shown below, where in line reactance are indicated in per unit. Line resistances are negligible. The magnitude of all four-bus voltages is specified to be 1.0 per unit. Injected bus powers (S) are specified below. Considering bus-1 as slack bus find out only real power line flows and reactive power generation at each bus using DC ( Approximate ) load flow method. **06**

BUS DATA : (In PU)

Bus	PD	QD	PG	QG
1	1.0	0.5	?	?
2	1.0	0.4	4.0	?
3	2.0	1.0	0	?
4	2.0	1.0	0	?



- Q.4 (a)** Explain ‘Generation shift factor’ and ‘line outage distribution factor’ for security of power system. **06**
- (b)** Explain performance index (PI). How it is useful for contingency selection? **06**
- OR**
- Q.4 (a)** Discuss effect of traveling waves on short circuited transmission line. **06**
- (b)** Explain Bewles Lattice diagram and state its usefulness in studying performance of traveling waves on power system.. **06**
- Q.5 (a)** What is ‘State Estimation’? State application of state estimation in power system. **06**
- (b)** Explain Maximum Likelihood Weighted Least Squares Estimation. **06**
- OR**
- Q.5 (a)** Explain sparsity techniques and its advantages. State any one method to store sparse matrix in computer. **06**
- (b)** Compare backward Euler’s method and trapezoidal method in context to application of these methods to the large scale power systems. **06**

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