[Total No. of Questions - 8] [Total No. of Printed Pages - 3] (2125)

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M. Tech 1st Semester Examination

Power System Analysis & Design (NS)

EE1-512

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any Five question. All questions carry equal marks.

1. For the transmission network in Fig. 1, the lines 2-3 and 2-4 have half-line charging admittance of j0.005 and j0.01 respectively in p.u. Write Y_{BUS} matrix by inspection. The shunt capacitor at bus (4) has an admittance of j0.02. (20)

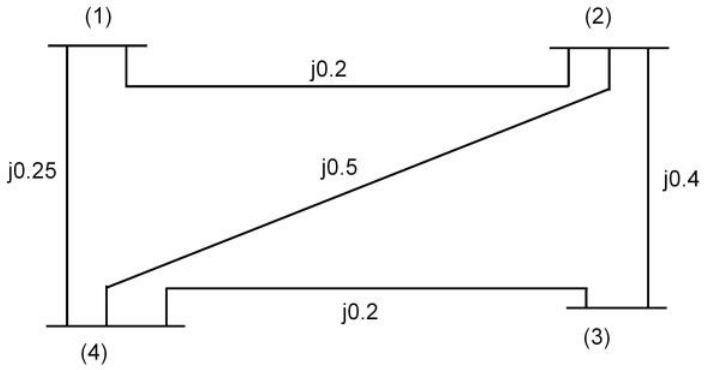

Fig. 1

[P.T.O.]

2. For the power system network shown in Fig. 2 and load flow data given in Table-1 carry out single iteration of load flow using Gauss-Seidal method. Line reactances are shown in the Fig. 2. Bus 1 is the slack bus and bus 2 and 3 are the load and voltage-control buses, respectively. (20)

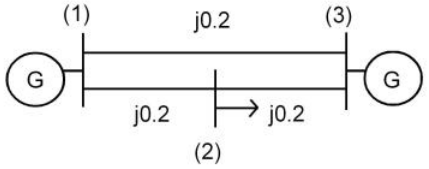

Fig. 2

Table - 1

Bus No.	Demand (p.u)		Generation (p.u)		Voltage	
	Real	Reactive	Real	Reactive	IVI	δ(degree)
1	0.0	0.0	unspecified	unspecified	1.04	0
2	1.0	0.8	0.0	0.0	unspecified	unspecified
3	0.0	0.0	1.0	unspecified	1.005	unspecified

3. In Z_{BUS} building algorithm how partial Z_{BUS} matrix get modified on the addition of

   (a) a branch

   (b) a link

   Derive expression in each case. (10+10=20)

4. (a) Derive an expression for three-phase power in terms of symmetrical components.

   (b) Give any two techniques for storing sparse matrix. (10+10=20)

5. Derive an expression for fault current, bus voltage during faulted conditions and current flowing through elements of three-phase network when line-to-ground (L-G) fault occurs at one of the buses in symmetrical component domain. (20)

6. How addition of link is realized in three-phase Z_{BUS} building algorithm? (20)

7. (a) For the given voltage profile of the power system network, derive expression for active and reactive power flow through a transmission line in terms of its parameters.

   (b) Derive expressions for element voltages in terms of branch voltages and for element currents in terms of its link currents through graph matrices. (10+10=20)

8. (a) Derive fast-decoupled load flow method from Newton-Raphson method and also list the approximations made.

   (b) With the help of transformation matrix express sequence voltage and current vectors in terms of phase quantities. (10+10=20)