B.Tech III Year II Semester (R09) Supplementary Examinations May/June 2017

POWER SYSTEM ANALYSIS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

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1 (a) What is a primitive network and represent its forms? Prove $Y_{Bus} = A^T[Y]A$ using singular transformation.

(b) Form the Y_{Bus} for the given network in table.

Element	R,p.u	X,p.u
1-2	0.05	0.15
1-3	0.10	0.30
2-3	0.15	0.45
2-4	0.1	0.30
3-4	0.05	0.15

2 (a) Explain the algorithm for the addition and removal of lines in power system.

(b) A two – Bus system has $Z_{Bus} = \begin{bmatrix} j0.11 & j0.045 \\ j0.045 & j0.13 \end{bmatrix}$p.u if an impedance Zb = j0.06 p.u. is connected between buses 1 and 2, what is the new Z_{Bus}.

3 Derive the basic equations for load flow studies and also write the assumptions and approximations to get the simple equations.

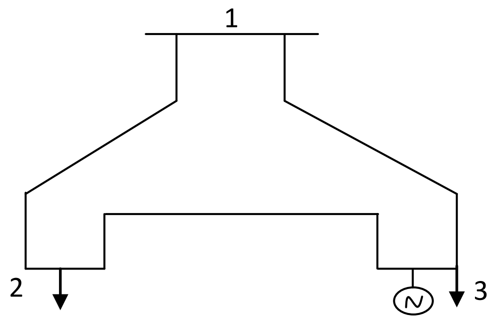
4 Consider the single line diagram of a power system shown in below. Take bus-1 as slack bus and the Y_{Bus} matrix is given below.

$$Y_{BUS} = \begin{bmatrix} 2-j15 & -1+j6 & -1.5+j8 \\ -1+j6 & 4-j10 & -3+j6 \\ -1.5+j8 & -3+j6 & 5-j6 \end{bmatrix}$$

Scheduled generation and loads are as follows:

Bus no.	Generation		Load		Assumed bus voltages
	MW	MVAR	MW	MVAR	
1	0	0	0	0	1.04+j0.0
2	0	0	250	150	1.0+j0.0
3	100	70	50	20	1.0+j0.0

Using Newton-Raphson method, obtain the bus voltages at the end of 1st iteration.



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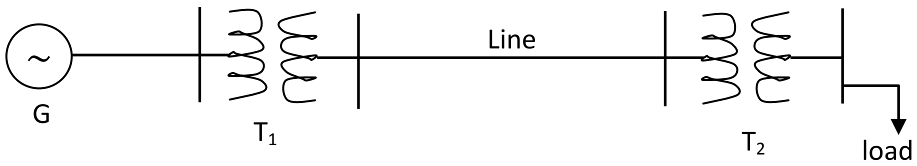
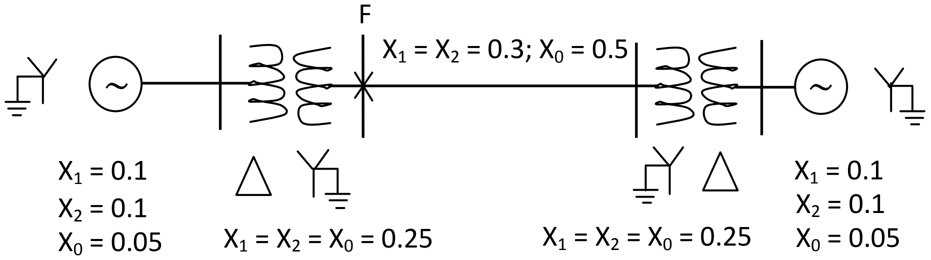
5 Obtain pu impedance diagram of the power system of figure below. Choose base quantities as 15 MVA and 33 KV.
Generator: 30 MVA, 10.5 KV, X'' = 1.6 ohms.
Transformers T1 & T2: 15 MVA, 33/11 KV, X = 15 ohms referred to HV transmission line: 20 ohms/phase.
Load: 40 MW, 6.6 KV, 0.85 laging p.f.



6 For the system shown in figure below. A LLG fault occurs at point F. Find fault current.



7 A salient pole synchronous generator is connected to an infinite bus via a line. Derive an expression for electrical power output of the generator and draw $p - \delta$ curve.

8 Explain step-step method of solving the swing equation. Also write assumptions made.

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