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# SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :B.E - EEE

Title of the Paper :Power system Analysis

Max. Marks :80

Sub. Code :414504-514504

Time : 3 Hours

Date :13/11/2009

Session :FN

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PART - A

(10 x 2 = 20)

Answer ALL the Questions

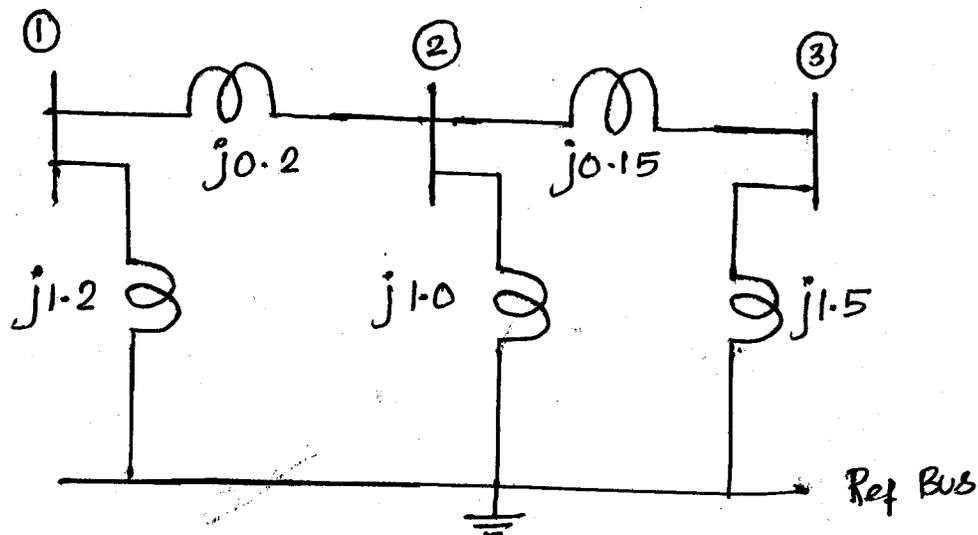
1. What is meant by per unit quantities? What is its need?
2. What is the use of symmetrical components?
3. What is Slack bus?
4. NR method is better when compared to other methods of power flow-Justify.
5. What are the different types of faults in power system? Which type of fault is more severe?
6. What is meant by short circuit capacity?
7. What is meant by infinite bus?
8. Define: Stability limits.
9. What is the use of load curves in power systems?
10. Draw the incremental cost curves for thermal systems.

## Answer All the Questions

11. A 300 MVA, 20Kv, 3 $\Phi$  generator has sub transient reactance 20%. The generator is connected to two synchronous motors through 64 Km transmission line having transformers on both sides. The transformer on generator side is of 3 type with 350MVA, 20/230Kv, 10% reactance and on the motor side of the transmission line is of three single phase transformer each rated for 100MVA, 127/13.2Kv with 10% reactance. The reactance of the transmission line is 0.5 $\Omega$ /Km. Draw the reactance diagram by selecting generator rating as base values.

(or)

12. Determine the  $Z_{bus}$  matrix for the reactance diagram given below.



13. Carry out one iteration of power flow analysis for the power system with the following data and given the voltages in polar form at the end of I iteration by NR method.

Bus no	Bus type	V pu	Generation pu		Load pu	
			P	Q	P	Q
1	Slack	1.01	-	-	-	-
2	PV	1.0	0.7	-	-	-
3	PQ	-	-	-	1.0	0.4

Line data

Bus code	Impedance
1-2	$j0.15$
2-3	$j0.15$
3-1	$j0.15$

(or)

14. (a) Explain the Gs method of power flow analysis, by developing the power flow equations. Also explain the use of acceleration factor for convergence of solution.  
 (b) Compare GS method with NR method.

15. A synchronous generator is connected to a motor through a transmission line having 10% of reactance on the base value of the machines. Both motor and generator are rated at 30,000KVA, 13.2Kv having sub-transient reactance of 20%. The motor is drawing 20,000Kw at 0.8 pf load. The motor terminal voltage is 12.8Kv. When a symmetrical fault occurs at the motor terminals find the sub-transient current in generator and at fault point.

(or)

16. Obtain the expression for fault current and the voltages at the faulted bus and non-faulted buses for a LG fault occurs in power systems. Draw the relevant diagrams required for the analysis.
17. (a) Derive the Swing equation for a single machine connected to infinite bus system.  
 (b) Explain the solution of Swing equation by point by point method.

(or)

18. (a) Find the steady state power limit for a synchronous motor consisting of a generator with reactance of 0.6pu connected to an infinite bus through a transmission line having a reactance of 0.8 pu. The terminal voltage of generator is 1.15pu and the voltage at infinite bus is 1.00pu  
 (b) Explain “Equal area criterion”

19. (a) Explain the factors affecting the choice of size and number of units of generators.  
(b) What is meant by tariff? Explain the different types of tariffs.  
(or)
20. What is meant by co-ordination equation? Derive co-ordination equation for a two generator unit system with and without losses.