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Question Paper Code: 31533

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Fifth Semester

Electrical and Electronics Engineering

01UEE503 – POWER SYSTEM ANALYSIS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. What are the advantages of per phase analysis in power system?
2. If the reactance in ohms is 1.5 Ω, find the p.u value for a base of 10 *MVA* and 10 *kV*.
3. Mention the advantages of Gauss-Seidel method of load flow analysis.
4. What is the need for slack bus?
5. What are the causes for faults in power system?
6. Define short circuit capacity.
7. List the types of unsymmetrical faults.
8. What are the properties of sequence operator '*a*'?
9. Write down the power angle equation of a two machine system.
10. What is the use of swing curve?

PART - B (5 x 16 = 80 Marks)

11. (a) Draw the reactance diagram for the power system shown in figure 1. Neglect the resistance and use a base of 50 *MVA* and 13.8 *kV* on generator G_1. (16)

G_1 : 20 MVA, 13.8 kV, X" = 20%

G_2 : *30 MVA, 18.0 kV, X" = 20%*

G_3 : *30 MVA, 20.0 kV, X" = 20%*

T_1 : *25 MVA, 220/13.8 kV, X = 10%*

T_2 : *3* single phase units each rated *10 MVA, 127/18 kV, X = 10%*

T_3 : *35 MVA, 220/22 kV, X = 10%*

Determine the new values of per unit reactance of G_1, T_1, transmission line 1, transmission line 2, T_2, G_2, T_3 and G_3.

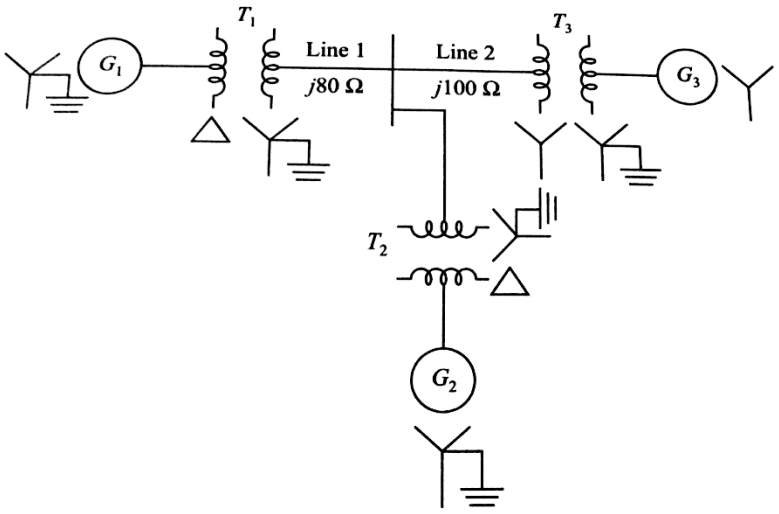

Figure 1

Or

(b) Determine the $[Y_{bus}]$ matrix of the representative power system shown in figure 2. (16)

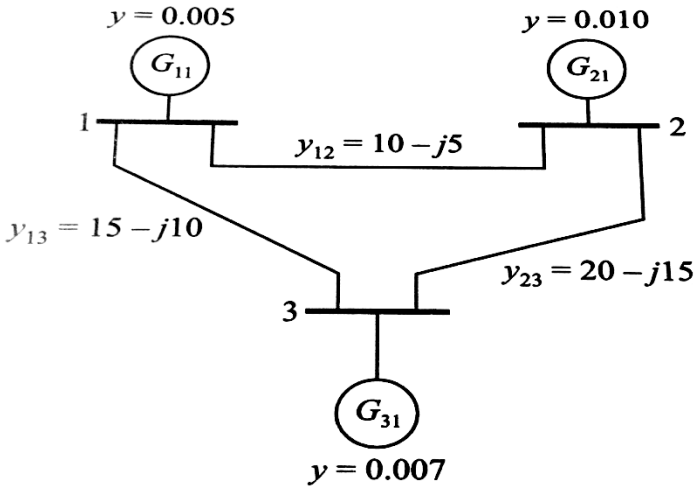

Figure 2

12. (a) (i) What are the classifications of buses? Mention the specified and unspecified quantities of each bus. (4)

(ii) What is power flow problem? Write down the basic power flow equations. (6)

(iii) Compare Gauss Seidel, Newton Raphson and Fast Decoupled methods of load flow study. (6)

Or

(b) Write the algorithm and flow chart of the FDLF method. (16)

13. (a) A 25 *MVA*, 11 *kV* generator with 20% sub-transient reactance is connected through a transformer to a bus which supplies four identical motors as shown in figure 3. The sub-transient reactance of each motor is 20% on a base of 5 *MVA*, 6.6 *kV*. The three phase rating of the transformer is 25 *MVA*, 11/6.6 *kV* with a leakage reactance of 10%. The bus voltage at the motors is 6.6 *kV* when a 3 phase fault occurs at the point *F*. For the fault specified, calculate (i) the subtransient current in the fault, (ii) the subtransient current in breaker *A* and (iii) the momentary current in breaker *A*. (16)

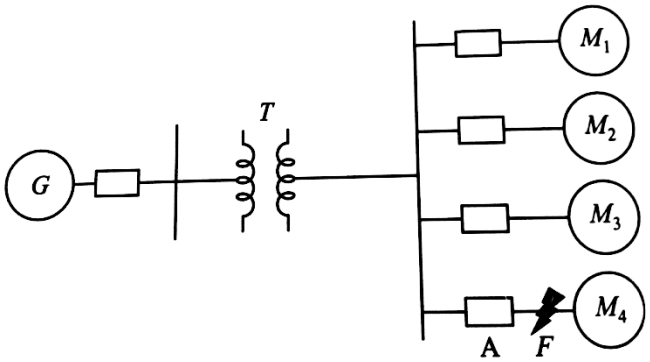

Figure 3

Or

(b) Write the steps for the fault calculation of an *n* bus system using bus impedance matrix. (16)

14. (a) (i) The symmetrical components of a set of unbalanced three phase currents are: I_{a0} = 100 *A*, I_{a1} = 200-j100 *A* and I_{a2} = -100 *A*. Calculate the original unbalanced currents I_{ao}, I_{a1}, I_{a2}. (10)

(ii) What are sequence impedances? What is the use of sequence networks? Draw sequence networks for L-L fault? (6)

Or

(b) Derive the equation of fault current for an L-L fault in power system. (16)

15. (a) (i) Derive the swing equation and what is swing curve? (8)

(ii) Derive the equation for critical cleaning angle determination. (8)

Or

(b) What is the principle behind the equal area criterion in determining stability? Explain the equal area criterion to a single machine connected to infinite bus system. (16)

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