R13

Code No: 126AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, April - 2018

COMPUTER METHODS IN POWER SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) Define the terms TREE, Co-TREE and LINK of a graph. [2]
b) What is an incidence Matrix? Explain with a suitable example. [3]
c) What is necessity of power flow studies? [2]
d) Compare all load flow methods. [3]
e) What is the necessity of short circuit analysis? [2]
f) List out the advantages of per unit representation for power systems. [3]
g) Define steady state, dynamic and transient stability. [2]
h) Define synchronizing power coefficient. [3]
i) Give the limitations of equal area criterion. [2]
j) What are the methods to improve transient stability? [3]

PART - B

(50 Marks)

2.a) Form the Y_{BUS} for the system shown in below figure 1, using singular transformation method.

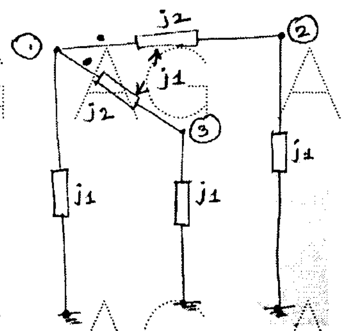

Figure 1

b) Give the steps for modification of existing Z_{BUS}, when a branch Z_b is added from existing bus(k) to the reference bus. [5+5]

OR

3.a) Show that $Y_{BUS} = A^T Y_{pre} A$.

b) Form the Z_{BUS} for the system shown in below figure 2. [5+5]

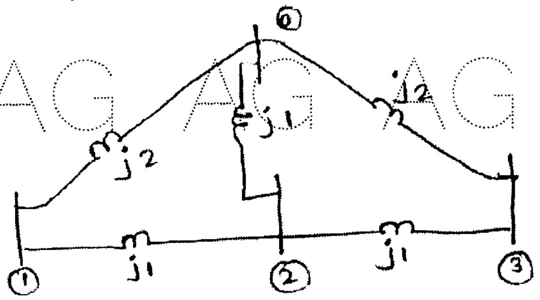

Figure 2

4.a) Briefly discuss about the classification of load flow methods and their application in the real world.

b) For the three bus system shown in below figure 3, perform 2 iterations of Gauss Seidal load flow method. The value shown in figure are line reactances in p.u. and shunt capacitor of susceptance J0.2 per unit. [5+5]

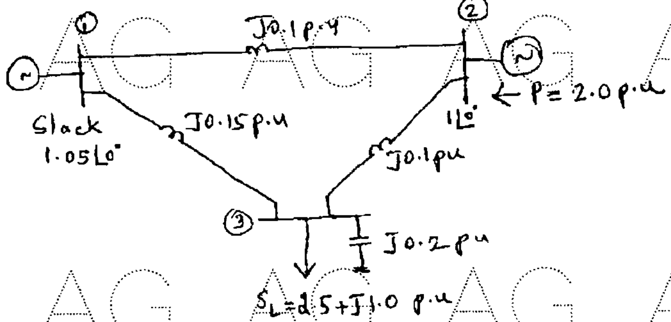

Figure 3

OR

5. Explain the Newton Raphson Load flow method in polar force, and derive the equation to compute the Jacobian matrix elements. [10]

6. For the system shown in figure 4 below. All values shown are per unit reactance on their own basic.

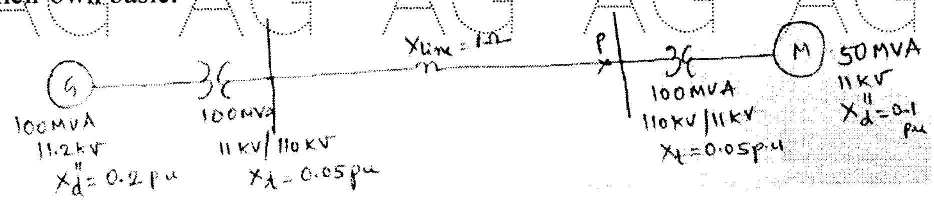

Figure 4

a) Draw the single line reactances diagrams of the system with system base as 100 MVA and 11.2 kV.

b) Determine the symmetrical sub transient fault current for a balanced fault at point 'P'. [5+5]

OR

7.a) Determine the sequence currents for the system of un balanced phase currents as given below are drawn by a balanced delta load with Z_{phase}= J10 Ω.

$$I_a = 10\angle 0^0, \quad I_b = 10\angle 180^0, \quad I_c = 0^0$$

b) For the system shown in figure 5, find the fault current for a LG fault at print 'P'. Assume fault load current to be zero. [5+5]

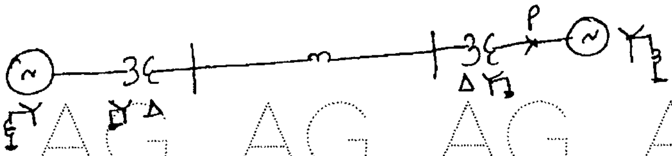

Figure 5

Generator: 100 MVA, 11 kV, $X_1 = X_2 =$ J0.2 p u, $X_0 =$ J0.05 p u, $X_n =$ J0.3 p u.

Transformer1& 2: 100 MVA, 11 kV/33kV, $X_1 = X_2 =$ J0.01 p u, $X_0 =$ J0.012 p u

Transmission Line; 33 kV, 100 MVA, $X_1 = X_2 =$ J0.02 p u, $X_0 =$ J0.05 p u

System Motor: 100 MVA, 11 kV, $X_1 = X_2 =$ J0.15 p u, $X_0 =$ J0.05 p u and $X_n =$ J0.2 p u.

8.a) What is steady state stability limit? Derive the necessary condition for the system to be steady state stable.

b) For an SMVB system shown in below figure 6, the following are the operating conditions: $V_\infty = 1\angle 0^0$, $|V_t| = 1.0$, line reactance jx = 0.1 per unit and sub transient reactance of the synchronous machine is X″d = J0.2 pu.

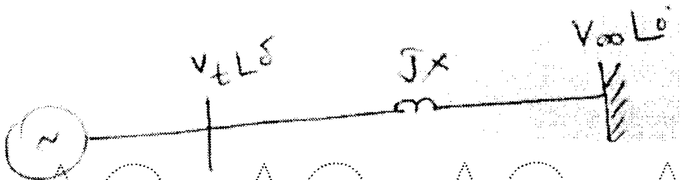

Figure 6

Determine the power angle curve of the machine. Assume $p_m = \rho_e = 1.0$. [5+5]

OR

9.a) Briefly discuss about the methods to improve steady state stability.

b) What is power angle curve? Deduce the relation from a SMIB system having lossless line. [5+5]

10.a) What is swing and derive the swing equation?

b) Give the applications of equal area criterion. [5+5]

OR

11. For the system shown in below figure 7.

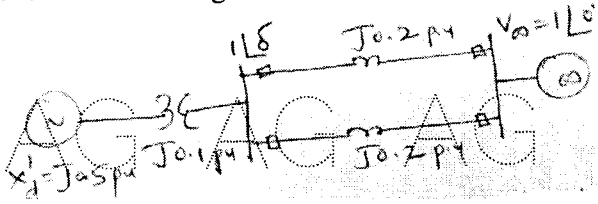

Figure 7

a) Determine the maximum permissible increase in ρ_m (mechanical input power) that is possible to lead the system in to critical stability. Assume initially $\rho_m = \rho_e = 1.0$ pu.

b) Determine the critical clearing angle, when a 3 d balanced fault occurs at the middle of the second line and the fault is cleared by operating the line using CB's at both ends. [5+5]

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