R13

Code No: 126AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, May - 2019
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: graphs, tree, co-tree. [2]
b) Distinguish between branch and node voltage and current. [3]
c) What is slack Bus? What is its role in load flow solution? [2]
d) What is acceleration factor? Give its significance. [3]
e) What is symmetrical component analysis? Explain. [2]
f) What are the classification line faults and their general behavior? [3]
g) What is synchronizing power coefficient? Explain. [2]
h) What are the methods to improve steady state stability? [3]
i) Give your comment on the system stability with (or) with out considering damper windings. [2]
j) Give the advantages of auto reclosing and fast acting circuit breaker from the system stability point of view. [3]

PART - B

(50 Marks)

2.a) Form the Y_{BUS} for the systems shown in below figure 1 using direct inspection method. Take half line charging susceptance as J2ʊ.

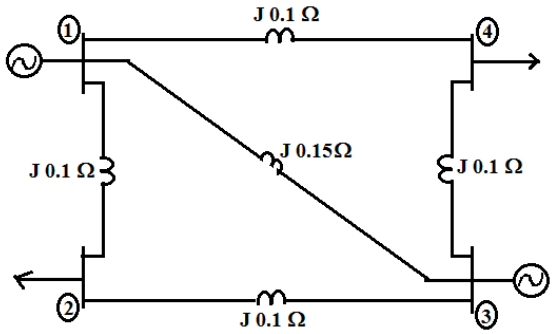
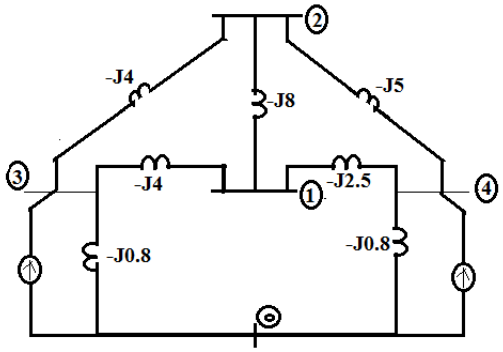


Figure 1

b) Give the Z_{BUS} building algorithm. [5+5]

OR

3.a) Determine the Y_{BUS} for the system shown in below figure 2 using singular transformation method.



(Per unit admittance diagram)

Figure 2

b) Form the Z_{BUS} for the system shown in below figure 3. [5+5]

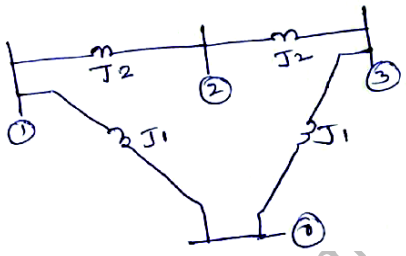


Figure 3

4. Explain the Gauss Seidal Load flow solution method with the help of algorithm and flowchart. Also include the logic for PV buses. [10]

OR

5.a) Explain the fast decoupled load flow algorithm. List out all the assumptions made in arriving to it.

b) Briefly discuss about DC load flow method and its merits and demerits. [5+5]

6. For the system shown in below figure 4 has the following:

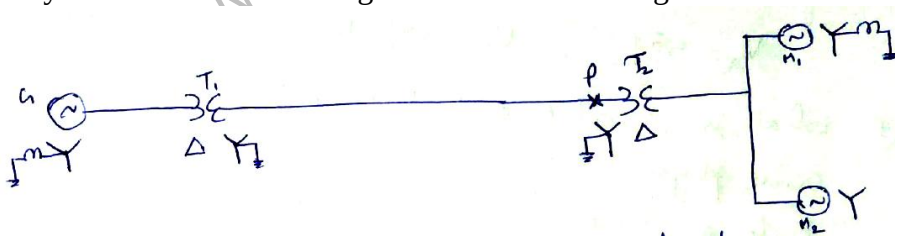


Figure 4

Generator: 30 MVA, 13.8 kV, 3 phase alternator has $X_d'' = 15\ \%$, $X_2 = 15\%$, $X_0 = 5\%$ and $X_n = 2\ \Omega$.

Motor: M_1: 20 MVA, 12.5 kV with $X_d'' = 20\ \%$, $X_2 = 20\%$, $X_0 = 5\%$ and $X_n = 2\ \Omega$.

Motor: M_2: 10 MVA, 12.5 kV with $X_d'' = 20\ \%$, $X_2 = 20\%$, $X_0 = 5\%$.

Transformers 1 & 2: 35 MVA, 13.2 Δ/ 115 Y with leakage reactance of 10%.

Transformer Line: Total line reactance of 200 Ω. Take the MVA and kV rating in generator circuit as base values.

a) Obtain the positive, negative and zero sequence networks of the system.

b) Determine the fault current when a LG fault takes place at point 'p'. Assume the prefault voltage at fault point equal to 1.0 per unit and initial loadings are zero. [10]

OR

7.a) Obtain the symmetrical components for the system of unbalanced voltages given by $I_a = 50\angle 0^0$, $I_b = 50\angle -100^0$, $I_c = 50\angle +125^0$

b) What is short circuit MVA rating of a Bus? Give physical significance of it and explain the role of series reactors in power system.

c) Derive the expression to determine the LG fault current between phase 'a' and ground using symmetrical component analysis. [10]

8.a) Define steady state transient stability of the power system and deduce the necessary condition for the system to be steady state stable is $\frac{dp}{d\delta} > 0$.

b) Derive the power angle curve for a single machine connected to infinite system through a lossless line having a line reactance of J X Ω. Assume machine impedance is merged into line (figure 5). [5+5]

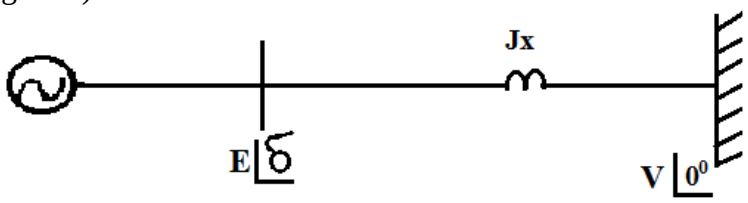


Figure 5

OR

9. For the system shown in below figure 6.

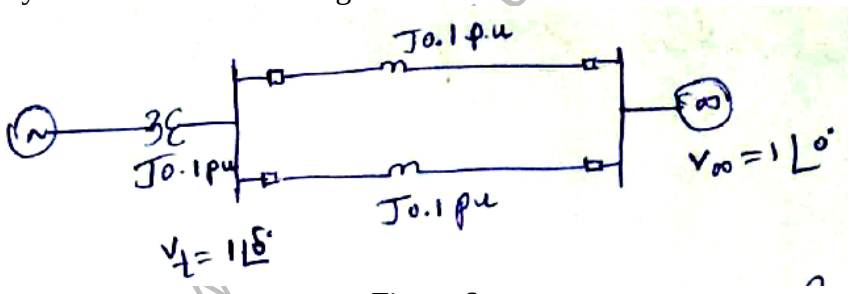


Figure 6

a) For an initial operating condition $\rho_m = \rho_e = 1.0$ pu. Determine the power angle curve of the machine.

b) For a fault at the mid point of second line, what is the new power angle curve of the machine?

c) If the fault is cleared by opening the line, determine the post fault power angle curve of the machine. [10]

10.a) Briefly explain the concept of determining the transient stability of a SMIB system using equal area criterian.

b) A SMIB system under steady state delivers 1.0 per unit power to the infinite system and has a power angle equation of $P_e = 2.1\sin\delta$. Determine the critical clearing angle of the system when a 3 phase fault occurs at the generator system. [5+5]

OR

11. Explain the step by step procedure to solve the swing equation using point by point method. [10]

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