Exam.Code:0936
Sub. Code: 6986

1019

B.E. (Electrical and Electronics Engineering)
Sixth Semester
EE-601: Computer Aided Power System Analysis

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.

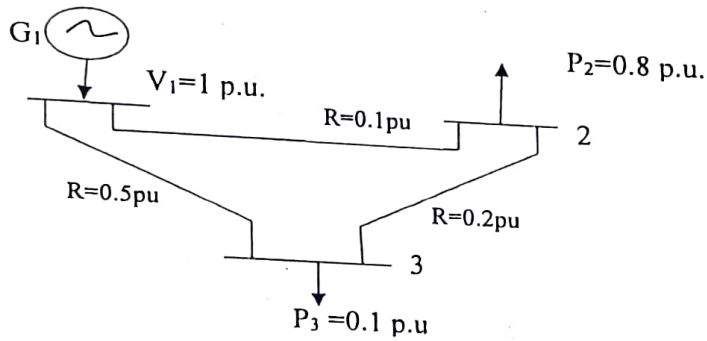
x-x-x

Q.I

1. What is condition for economic load dispatch when losses are included in the system?
2. What is the limitation of equal area criterion of stability analysis?
3. What is the need of symmetrical components in fault studies of power system?
4. Draw equal area diagram showing both accelerating and decelerating areas when a mechanical input to the generator changes from 0.9 p.u. to 0.7 p.u.?
5. Draw zero sequence diagram for transformer connected as Y-Δ. (5x2=10)

PART-A

Q.II Figure shows the three bus resistive network. Use N-R method in Y_{BUS} frame of reference to compute (i) bus voltages; (ii) line currents (iii) slack bus power (iv) total losses in the system. Assume bus 1 as the slack bus with a voltage of 1.0 p.u. The parameters are shown in the figure below:



(10)

Q.III a) Prove that the changes in tie line power between two control areas, for a small changes in voltage angles can be represented by $\Delta P_{tie1-2} = \frac{V_1 V_2}{X_{12}} \cos(\delta_1^0 - \delta_2^0)(\Delta\delta_1 - \Delta\delta_2)$. Hence deduce the transfer function model for the tie line power flow.

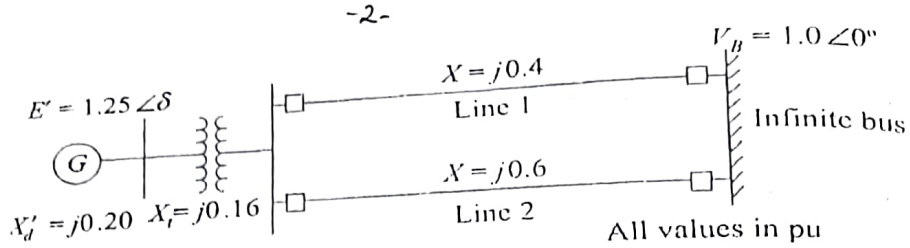
(5)

b) What is the significance of critical clearing time and angle? Find the expression for them for a generating system feeding a load through double circuit line and a 3 phase to ground fault occurs in one of the lines near the bus. The fault is cleared by restoring the line back. Use equal area criterion to deduce the expressions.

(5)

Q.IV A synchronous machine is supplying a real power of 1.0. p.u. to an infinite bus as shown in the Figure below. A temporary 3-phase fault occurs in line 2 at one tenth of the distance from the infinite bus end. (i) What is the rotor angle when the generator is operating synchronously? (ii) What is the generator output accelerating power when fault occurs? (iii) If the fault is cleared after 15 cycles, by opening of the faulted line, compute the rotor angle and decelerating power after the fault line is opened. The power frequency if 50 Hz and inertia constant of the generator is 3.5 MJ/MVA.

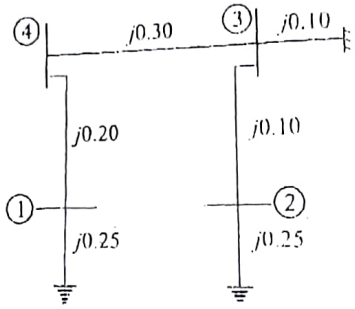
(PTO)



(10)

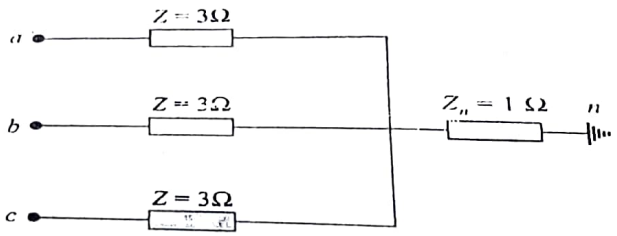
PART-B

Q V. For the network shown below assemble Z_{Bus} matrix. The impedance of each element is shown in the figure.



(10)

Q VI. a) Determine the sequence impedance network matrix and develop sequence network for the circuit shown in Figure below. The phase and neutral impedances are shown in the diagram. (5)



b) Determine the relation for the fault current and voltage when a 2LG fault occurs on a three phase power system with fault impedance Z_f. (5)

Q VII An 11 KV, 100 MVA alternator having a sub-transient reactance of 0.25 p.u. is supplying a 50 MVA motor having a sub-transient reactance of 0.2 p.u. through a transmission line. The line reactance is 0.05 p.u. on a base of 100 MVA. The motor is drawing 40 MW at 0.8 p.f. leading with terminal voltage of 10.95 kV when a three phase fault occurs at the generator terminals. Calculate the total current in generator and motor under fault condition. (10)

X-X-X