UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B.Tech Electrical — **Semester – VII**
Subject (Course): Simulation of Electrical circuit — **Max. Marks : 100**
Course Code :ELEG-461 — **Duration : 3 Hrs**
No. of page/s:2

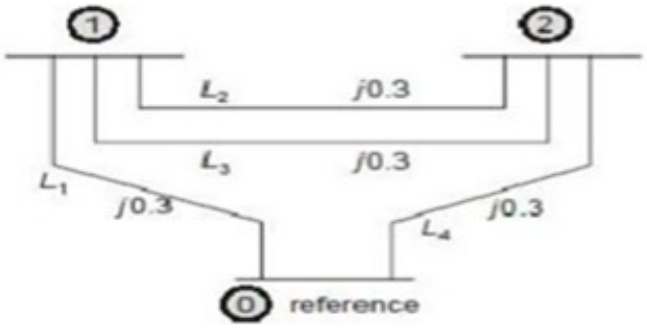
SECTION A (5*4=20)

Note: Attempt all questions

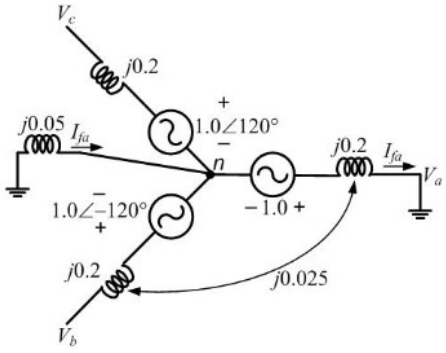
Q1. [CO4] What are the assumptions required for modelling of the synchronous generator?
Q2. [CO1] Analytically model a three phase single circuit transmission line.
Q3. [CO3] State the application of equal area criterion.
Q4. [CO5] Define: Critical clearing angle and Critical clearing Time.
Q5. [CO2] Draw the phasor diagram of steady state operation of the salient pole alternator.

SECTION B (4*10=40)

Q6. [CO4] In the given system, find Z_{bus} of the network using building Algorithm.



Q7. [CO2] Explain how the short circuit studies are executed with the help of flowchart.
Q8. [CO1] Develop an Algorithm and flowchart for fast decoupled method in load flow analysis.
Q9. [CO3] Draw the flowchart for the solution of single line to ground fault problem. A three-phase Y-connected synchronous generator is running unloaded with rated voltage when a single LG fault occurs at its terminals. The generator is rated 20 kV, 220 MVA, with sub-synchronous reactance of 0.2 per unit. Assume that the sub-transient mutual reactance between the windings is 0.025 per unit. The neutral of the generator is grounded through a 0.05 per unit reactance. The equivalent circuit of the generator is shown below. Find out the negative and zero sequence reactance.

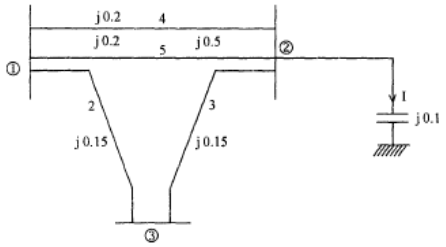


SECTION C **(2*20=40)**

Note: Attempt either Q11 or Q12 question

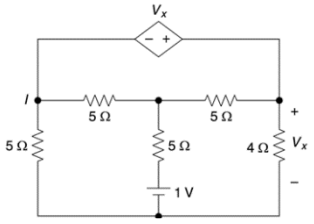
Q10. [CO4,5] (a) Describe the algorithm of two branches (Za and Zb) with mutual impedance (Zm) between four buses of the power system.

(b) Find Y_{bus} of the system shown below.



Q11. [CO2] (a) Develop the flowchart to find economic generation schedule considering transmission line losses.

[CO1] (b) Draw the oriented graph and obtain tie-set matrix of the circuit given below and also calculate the voltage V_x



OR

Q12. [CO3] An alternator is delivering power of 0.8 p.u. at a terminal voltage of 1.05 p.u. This alternator is suddenly synchronized to an infinite bus through a transformer of reactance 0.1 p.u. and a double circuit transmission line of 0.4 p.u. reactances each. Determine the swing equation assuming infinite bus voltage magnitude to be 1.0 p.u. The alternator has: X_d' =0.2 p.u. and H= 4 MJ/ MVA.

Roll No: ----------

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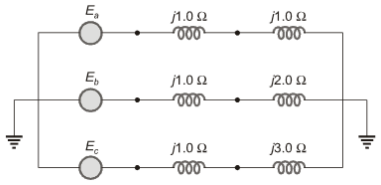
SECTION A (5*4=20)

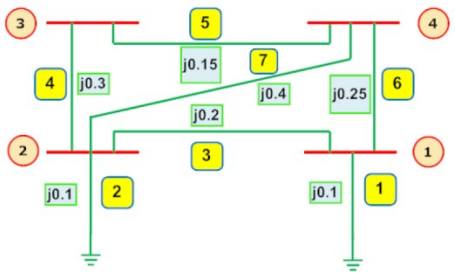
Note: Attempt all questions

Q1. [CO1]Develop the analytical modelling of a turbine.
Q2. [CO2]Draw the phasor diagram of the transient state operation of the salient alternator.
Q3. [CO3]List down the various type of the stability in power system.
Q4. [CO5]Define primitive network with the help of power system network
Q5. [CO4]A three phase alternator generating unbalanced voltages is connected to an unbalanced load through 3-phase transmission line as shown below. The neutral of the alternator and the star point of the load are solidly grounded. The phase voltages of the alternator are Ea= $10\angle 0^0$, Eb= $10\angle -90^0$, Ea= $10\angle 120^0$. Calculate positive sequence component of the load current.



SECTION B (4*10=40)

Q6. [CO1]In the given system, find Z_{bus} of the network using building Algorithm.



Q7. [CO1]Draw the flowchart for the solution of Double line to ground fault problem

Q8. [CO3]Develop an Algorithm of N-R method in load flow analysis.

Q9. [CO5]Write an algorithm for Type-4 Modification in Z_{bus} Building method.

SECTION C **(2*20=40)**

Q10. (a) [CO1] Describe the algorithm of two branches (Za and Zb) with mutual impedance (Zm) between five buses of the power system.

(b) [CO5] A 50 Hz, three phase synchronous generator delivers 0.8 p.u. power to an infinite bus-bar through a network of negligible resistance. A fault occurs which reduces the maximum transferable power to 0.50 p.u. from 1.5 p.u. at post fault condition and after the clearance of the fault the maximum transferable power is 1.20 p.u. . Determine the critical angle.

Q11. [CO4]Develop the flowchart to find economic generation schedule without considering transmission line losses.

OR

Q12. [CO3] Define swing curve and Derive swing equation for a single machine connected to an infinite bus. Also, develop the algorithm for the swing equation.