Code: 13A02604 **R13**

B.Tech III Year II Semester (R13) Regular Examinations May/June 2016

POWER SYSTEM ANALYSIS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define bus incidence matrix.

(b) Write the four ways of adding impedance to an existing system so as to modify bus impedance matrix**.**

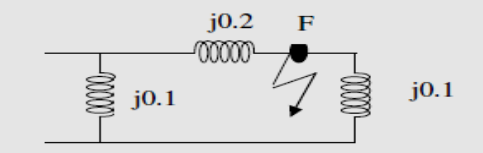
(c) What is the need for load flow study?

(d) What are the three classes of buses of a power system used in power flow analysis? What are the quantities to be specified and to be computed for each class during power flow solution?

(e) Write the load flow equation of Newton – Raphson method.

(f) Discuss the effect of acceleration factor in the load flow solution algorithm. How will you account for voltage controlled buses in this algorithm?

(g) Find the fault current in figure, if the pre fault voltage at the fault point is 0.97 p.u.?



(h) A generator is connected through a 20 MVA, 13.8/138 kV step down transformer, to a transmission line. At the receiving end of the line a load is supplied through a step down transformer of 10 MVA, 138/69 kV rating. A 0.72 pu load, evaluated on load side transformer ratings as base values, is supplied from the above system. For system base values of 10 MVA and 69 kV in load circuit, the value of the load (in per unit) in generator circuit will be___.

(i) State the causes of voltage instability.

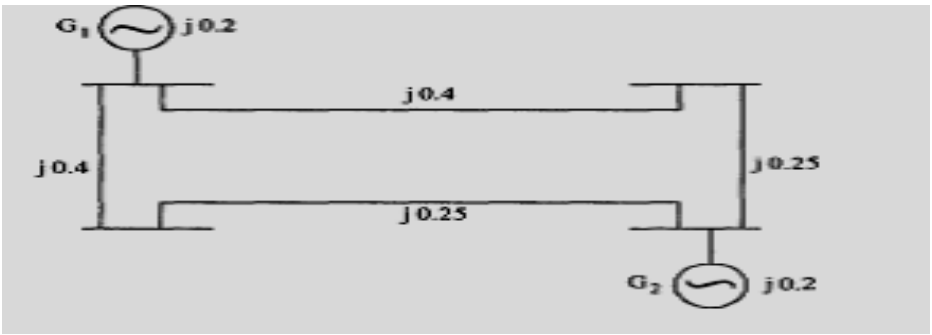
(j) State the assumptions made in stability studies.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

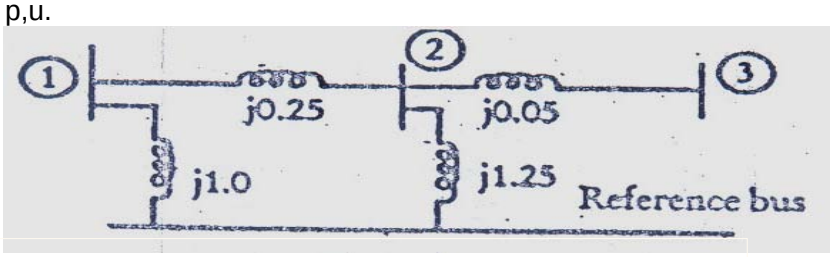
UNIT – I

2 Form the Y BUS by using singular transformation for the network shown below. including the generator buses.



OR

3 (a) Find the bus impedance matrix for the system whose reactance diagram as shown below. All the impedances are in p,u.



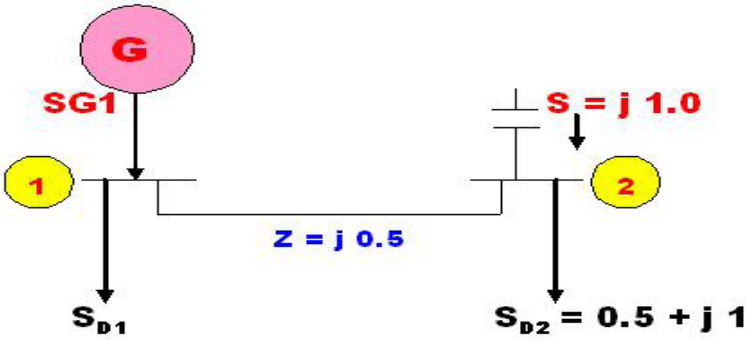
(b) Define the following terms with suitable example

(i) Tree. (ii) Branches. (iii) Links. (iv) Co-Tree. (v) Basic loop.

Contd. in page 2

UNIT – II

4 Obtain the voltage at bus 2 for the simple system shown below, using the Gauss–Seidel method, if $V_1 = 1\angle 0$ pu.



OR

5 (a) Explain clearly the algorithmic steps for solving load flow equations using Newton – Raphson method (polar form) when the system contains all types of buses. Assume that the generators at the P-V buses have enormous Q limits and hence Q limits need not be checked.

(b) Compare the advantage and disadvantage of GS and NR method.

UNIT – III

6 Explain clearly with detailed flowchart the computational procedure for load flow solution using fast decoupled load flow method when the system contains all types of buses.

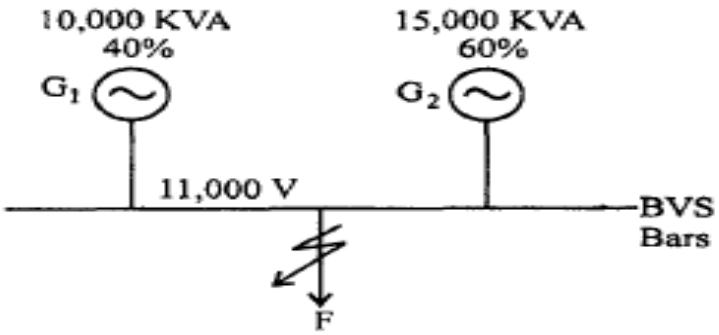
OR

7 Derive the power flow equation in polar form.

UNIT – IV

8 (a) Two generators rated at 10 MVA, 11 KV and 15 MVA, 11 KV respectively are connected in parallel to a bus. The bus bars feed two motors rated 7.5 MVA and 10 MVA respectively. The rated voltage of the motors is 9 KV. The reactance of each generator is 12% and that of each motor is 15% on their own ratings. Assume 50 MVA, 10 KV base and draw the reactance diagram.

(b) Consider the system shown in Fig. The percentage reactance of each alternator is expressed on its own capacity determine the short circuit current that will flow into a dead three phase short circuit at F.



OR

9 Derive the expression for fault current in double line to ground fault on unloaded generator. Draw an equivalent network showing the inter connection of networks to simulate double line to ground fault.

UNIT – V

10 (a) Explain the step-wise procedure of determining the swing curve of the above system using Modified Euler's method.

(b) Discuss the various methods of improving steady state and transient state stability.

OR

11 Write the swing equation describing the rotor dynamics of a synchronous machine connected to infinite bus through a double circuit transmission line.

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