Code No: RT32024 **R13** SET - 1

III B. Tech II Semester Supplementary Examinations, November - 2017

POWER SYSTEM ANALYSIS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1 a) What is meant by primitive network? [3M]

b) What are the assumptions made in Fast decoupled load flow method to speed up the rate of convergence? [4M]

c) Give the applications of the Z_{Bus} building algorithm. [3M]

d) What are the harmful effects of short circuit faults on the power system? [4M]

e) Define the symmetrical components and draw its vector diagrams. [4M]

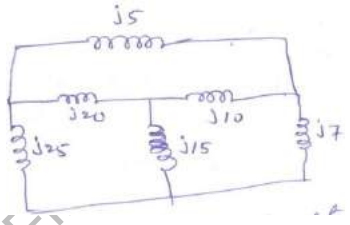
f) List the assumptions made in the transient stability solution technique. [4M]

PART -B

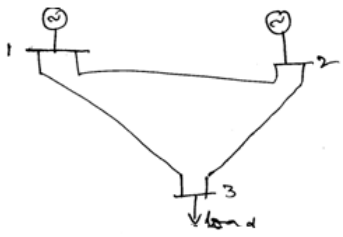
2 a) Write down the steps necessary to convert system parameters into per unit values. [6M]

b) [10M]

Obtain Y_{bus} by direct inspection method for the following network; assume the values are in p.u. admittances.



3 For the system shown in below figure with bus 1 as slack bus, calculate the voltages at the end of first iteration using decoupled method. Assuming all parameters are in p.u. [16M]



Bus code	Line impedance
1-2	j 0.2
3-2	j 0.25
3-1	j 0.4

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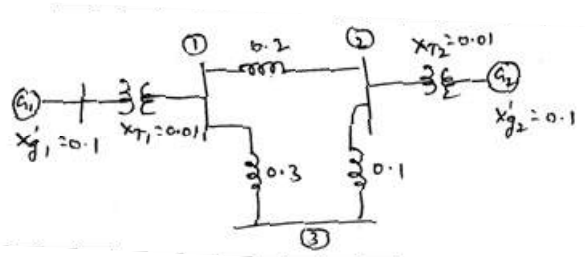
Bus code	Generation P	Q	Load P	Q	$\|V\|$	Reactive power limit Q_{min}	Q_{max}
1	-	-	-	-	1.05	-	-
2	5	0	-	-	1.02	0	5
3	-	-	2	1.2	-	-	-

4 Build the Z_{Bus} for the power system network shown below. Assuming all reactance's are in p.u values [16M]



5 Two 11 kV, 3-phase, 5MVA generators having sub transient reactance of 3% and 2% respectively operate in parallel. Suppose the power load through a 11/220 kV, 10 MVA transformer has 4% equivalent reactance. Calculate fault current and fault MVA for three phase fault occurs on the HT side of the transformer. Also calculate the fault MVA supplied by each generator. [16M]

6 a) Derive the expression for the fault current and terminal voltage for a line to line fault occurs at the terminal of an unloaded 3-phase alternator. Assume that the alternator has an isolated neutral. [9M]

b) Obtain the symmetrical components of the following set of unbalanced currents $I_a = 1.6\angle 250^0, I_b = 1.0\angle 180^0$ and $I_c = 0.9\angle 132^0$. Also find out the neutral current. [7M]

7 a) Explain the application of equal area criterion to determine stability of a synchronous machine connected to an infinite bus through a transmission line. [7M]

b) A 4 pole, 3-phase alternator rated 250MVA, 25kV, 50Hz has an inertia constant of 550 MJ/MVA [9M]
i) Calculate the stored energy in the rotor at synchronous speed.
ii) When the generator is supplying a load of 100MW, the input is increased by 20MW. Determine the rotor acceleration, neglecting losses.
iii) If the rotor acceleration in (ii) is maintained for 5 cycles, find the change in the torque angle and the rotor speed in rpm at the end of 5 cycles.

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