Reg.No. _____

Karunya UNIVERSITY

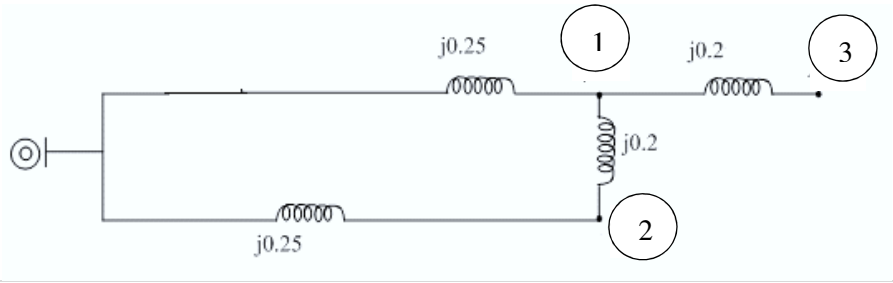
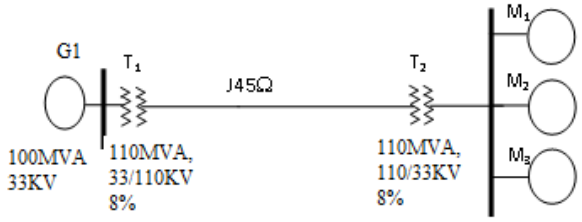
(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – April/May – 2017

Code : 14EE2014
Sub. Name : Power System Analysis

Semester : 2016-17 EVEN
Duration : 3hrs
Max. marks : 100

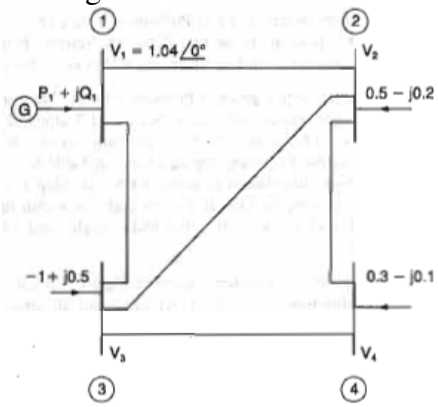
ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	List the advantages of p.u system.	CO1	5
	b.	Formulate Zbus for the system shown in the figure with element impedance marked in p.u using Zbus building algorithm. 	CO1	15
		(OR)		
2.	a.	Define bus-incidence matrix. How this matrix is used in bus admittance matrix formulation?	CO1	5
	b.	A 100 MVA, 33 kV, three phase generator has a reactance of 20 %. The generator is connected to motors through transmission lines and transformers. The motors have rated inputs of 30 MVA, 20 MVA and 50 MVA at 30 kV with 15 % sub transient reactance. The three phase transformers are rated at 110 MVA, 33kV /110 kV with leakage reactance of 8 %. The line has a reactance of 45Ω. Selecting the generator rating as base quantities in generator circuit, determine base quantities in other parts of system and evaluate the p.u. values. Draw the reactance diagram. 	CO1	15
3.	a.	In an unbalanced 3-φ system, the phase current $I_a = 1\angle -90^o$p.u, negative sequence current $I_{b2} = 4\angle -150^o$ p.u and zero sequence current $I_{co} = 3\angle 90^o$ p.u. Find the magnitude of phase current I_b in p.u.	CO2	5
	b.	Derive the expression for fault current due to single line to ground fault. Show how the sequence networks are connected for this fault.	CO2	15
		(OR)		
4.	a.	Define 'a' operator. Prove that $1+a+a^2=0$.	CO2	5
	b.	State the step-by-step procedure to analyze symmetrical fault in a power system.	CO2	15
5.	a.	Derive the voltage equation that can be iteratively solved by Gauss-Seidal method in power flow application.	CO2	5

	b.	For the given power system, carry out the power flow analysis using Gauss-Seidal method for one iteration. Use acceleration factor of 1.2. $Y_{bus} = \begin{bmatrix} 3-j9 & -2+j6 & -1+j3 & 0 \\ -2+j6 & 3.6667-j11 & -0.6667+j2 & -1+j3 \\ -1+j3 & -0.6667+j2 & 3.6667-j11 & -2+j6 \\ 0 & -1+j3 & -2+j6 & 3-j9 \end{bmatrix}$	CO2	15

Bus #	Power Injection (p.u)		Voltage (p.u)	
	P	Q	Magnitutde	Phase Angle
1	----	----	1.04	0^0
2	0.5	-0.2	----	----
3	-1	0.5	----	----
4	0.3	-0.1	----	----

(OR)

6.	a.	Identify the type of buses in the given power system. Which type of buses are missing? Write the chracteristics of each bus type. 	CO2	5
	b.	With the help of a flow-chart, explain how power flow analysis is carried out by FDLF method.	CO2	15
7.	a.	Define ED. List the algorithms available ins solving ED.	CO3	5
	b.	The heat-rate characteristics of three power plants are given by $H_1=0.0412P_1^2+7.21P_1+510$ MBtu/hr $H_2=0.0194P_2^2+7.85P_2+310$ MBtu/hr $H_3=0.0480P_3^2+7.97P_3+78$ MBtu/hr The fuel cost and power generation limits are Plant 1: 1.1 ₹/hr $150 \leq P_1 \leq 600$ MW Plant 2: 1.0 ₹/hr $100 \leq P_2 \leq 500$ MW Plant 3: 1.0 ₹/hr $50 \leq P_3 \leq 200$ MW Find the ED schedule and the total fuel cost for a demand 0f 850MW. Instead of following the ED schedule if you divide the load as 400 MW, 300 MW and 150 MW among the generators, what will be the total fuel cost?	CO3	15
		(OR)		
8.	a.	Discuss about the constraints in UC.	CO3	5
	b.	Derive the coordination equations for ED considering transmission losses.	CO3	15
		Compulsory:		
9.	a.	State the Power Quality Evaluation Procedure.	CO3	5
	b.	From the basic principles, derive swing eqution. State the usefulness of this equation.	CO2	15

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