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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January 2024 Semester End Main Examinations

Programme: B.E. | **Semester: VII**
Branch: Electrical and Electronics Engineering | **Duration: 3 hrs.**
Course Code: 19EE7PCPS2 | **Max Marks: 100**
Course: Power Systems-II

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Define primitive network. Explain with circuit and equations, the significance of it in both impedance and admittance forms.	*CO1*	*PO1*	**06**
	b)	Derive an expression for formation of bus admittance matrix **(Y_{BUS})** by singular transformation.	*CO1*	*PO1*	**06**
	c)	The transmission line data of a three bus power system network is given in Table -1.	*CO2*	*PO2*	**08**

Table – 1

Transmission Line		Line Impedance (pu)	Half Line Charging Admittance (pu)
From	**To**		
1	2	j 0.20	j 0.04
2	4	j 0.25	j 0.05
3	4	j 0.15	j 0.03
3	1	j 0.10	j 0.02
2	3	j 0.30	j 0.06

Compute the bus admittance matrix using inspection method.

		UNIT - II			
2	a)	Discuss the operating constraints considered during load flow analysis.	*CO2*	*PO1*	**04**
	b)	Explain the algorithm steps of Gauss-Seidel iteration method for load flow analysis.	*CO2*	*PO1*	**08**
	c)	The following is the transmission line data for a load flow study:	*CO3*	*PO3*	**08**

Transmission Line		Impedance (pu)
From	**To**	
1	2	0.05 + j 0.15
1	3	0.10 + j 0.30
2	3	0.15 + j 0.45
2	4	0.10 + j 0.30
3	4	0.05 + j 0.15

The schedule of active (P) and reactive (Q) powers are as follows:

Bus No.	P_i (pu)	Q_i (pu)	$\lvert V \rvert$ (pu)
1	--	--	$1.04 \angle 0^0$
2	0.5	- 0.2	--
3	- 1.0	0.5	--
4	0.3	- 0.1	--

Determine the bus voltages at the end of first iteration by applying Gauss-Seidel iteration method.

OR

3 a) Draw the flow-chart of Gauss-Seidel method of load flow analysis. *CO1* *PO1* **08**

b) For a 3 bus system shown in Fig. 3 (b), obtain voltages at the end of first iteration using G.S method. Also find power at bus 1. Line charging shunt admittances are $y_{12(sh)} = j\,0.2\,pu,\ y_{13(sh)} = j\,0.2\,pu,$ and $y_{23(sh)} = j\,0.1\,pu.$ Consider acceleration factor as 1.1. Line values in the diagram are in impedance form. Consider bus 1 as slack bus. *CO3* *PO3* **12**

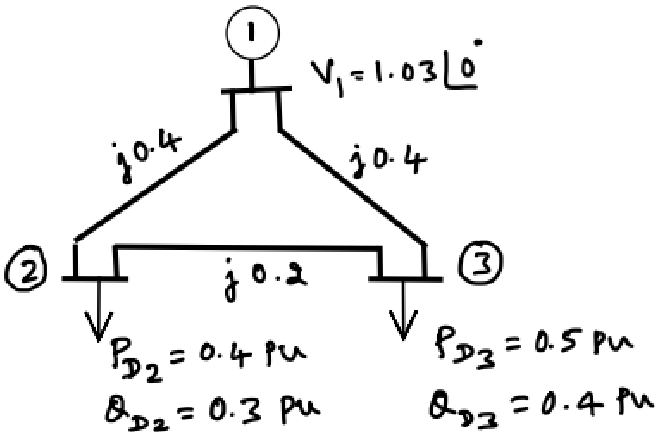

Fig. 3 (b)

UNIT - III

4 a) Explain the algorithm steps for FDLF method with assumptions. *CO2* *PO2* **08**

b) The system data is given in below table. Determine the power flow solution using FDLF method for one iteration. *CO2* *PO3* **12**

Bus code	Impedance
1-2	j0.1
1-3	j0.2
2-3	j0.2

Bus data			
Bus No.	**P**	**Q**	**V**
1	-	-	$1.0\angle 0^0$
2	$5.3(P_G)$	-	1.12
3	$3.64(P_L)$	$0.54(Q_L)$	-

			UNIT – IV			
	5	a)	Deduce an expression for transmission loss and its B-coefficients in terms of plant generation capacities for two units delivering a load	*CO4*	*PO2*	**10**
		b)	The operating fuel cost function of three generator units are given as: $C_1 = 0.004\, P_1^2 + 7.2\, P_1 + 350$ ₹/hr $C_2 = 0.0025\, P_2^2 + 7.3\, P_2 + 500$ ₹/hr $C_3 = 0.003\, P_3^2 + 6.74\, P_3 + 600$ ₹/hr The demand is 450 MW. Determine the following: i. Economic operating schedule. ii. Corresponding total cost of generation. iii. Saving compared with equal sharing.	*CO4*	*PO3*	**10**
			UNIT - V			
	6	a)	Discuss the functions of typical digital computer control and monitoring system in a power system with a neat block diagram.	*CO2*	*PO2*	**10**
		b)	Obtain the transfer function model and explain Automatic Load Frequency Control (ALFC) of a single area of an isolated power system.	*CO2*	*PO2*	**10**
			OR			
	7	a)	Discuss various operating states in power system with a neat diagram.	*CO2*	*PO2*	**10**
		b)	A 500 MVA, 50Hz turbo alternator operates at no load at 5000 rpm. A load of 50 MW is suddenly applied to the machine and the steam valves to the turbine commence to open after 0.7 sec due to the time lag in the governor system. Assuming inertia constant H of 4.5 kW-secs per KVA of generator capacity, calculate the frequency to which the generated voltage drops before the steam flow commences to increase to meet the new load.	*CO2*	*PO2*	**10**

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