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

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Electrical & Electronics Engineering **Duration: 3 hrs.**
Course Code: 19EE7PCPS2 **Max Marks: 100**
Course: POWER SYSTEMS-II **Date: 20.02.2023**

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

1 a) With usual notations, prove that $\mathbf{Y_{bus} = A^T Y A}$ using singular transformation. **06**

b) The transmission line data of a three bus power system network is given in Table 1(b). **06**

Table 1(b).

Transmission Line		Line Impedance (pu)	Half Line Charging Admittance (pu)
From	To		
1	2	0.06 + j 0.18	j 0.5
1	3	0.02 + j 0.06	j 0.6
2	3	0.04 + j 0.12	j 0.5

Compute the bus admittance matrix for the system by direct inspection method

c) Form Ybus by singlular transformation method for the given data in Table 1(c). **08**

Elements	Bus P-Q	Self-impedance	Mutual impedance
1	1-2	j0.6	
2	2-3	j0.5	j0.1 (with element 1)
3	3-4	j0.5	j0.2 (with element 2)
4	1-4	j0.3	

Table 1(c)

UNIT - II

2 a) With the help of a flow chart, explain the Gauss-Seidel method of load flow analysis. **10**

b) The following is the transmission line data for a load flow study: **10**

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 (pu)	Q (pu)	$\|V\|$ (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) Explain the different types of buses in power systems to perform power flow analysis **06**

b) Explain the Gauss-Seidel iteration method for load flow studies. **06**

c) The following is the system data for a load flow study: **08**

Bus code (p→q)	1 - 2	1 - 3	2 - 3	2 - 4	3 - 4
Line Admittance (pu)	2 – j8	1 – j4	0.666 – j 2.664	1 – j4	2 – j8

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

Bus No.	P (pu)	Q (pu)	$\|V\|$(pu)
1	--	--	$1.06 \angle 0^0$
2	0.5	0.2	--
3	0.4	0.3	--
4	0.3	0.1	--

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

UNIT - III

4 a) Compare the Newton-Raphson and Fast decoupled load flow methods with any six different parameters. **06**

b) What are the simplifications and Assumptions made in FDLF method? **06**

c) Draw the flow-chart of Newton-Raphson method of load flow analysis. **08**

UNIT - IV

5 a) Explain the following terms in the optimal operation of generators: **06**

i. Input – Output curve

ii. Incremental fuel cost curve

b) Obtain transmission line loss coefficients in terms of plant generation capacities for two units delivering a load **06**

c) The operating fuel cost of two generator units are given as: **08**

$$C_1 = 0.2\,P_1^2 + 40\,P_1 + 120 \quad \text{Rs/hr}$$
$$C_2 = 0.25\,P_2^2 + 30\,P_2 + 150 \quad \text{Rs/hr}$$

The maximum and minimum loading on each unit is 100 MW and 25 MW respectively. The demand is 180 MW and transmission losses are neglected. The load is equally shared by both the units.

Determine the following:

i. Economic Operating schedule
ii. Corresponding total cost of generation
iii. Saving obtained by loading the units as per equal incremental production cost

UNIT - V

6 a) Discuss various states in power system with a neat diagram. **10**

b) With the help of a block diagram, explain the functions of typical digital computer control and monitoring system in a power system. **10**

OR

7 a) Draw the block diagram of steam turbine governing system and explain the functions of the various components. **08**

b) Explain with block diagram, the modelling of: **12**

i. Speed governing system
ii. Turbine
iii. Generator and load

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