

Code No: 156CK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, August/September - 2021

POWER SYSTEM OPERATION AND CONTROL

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

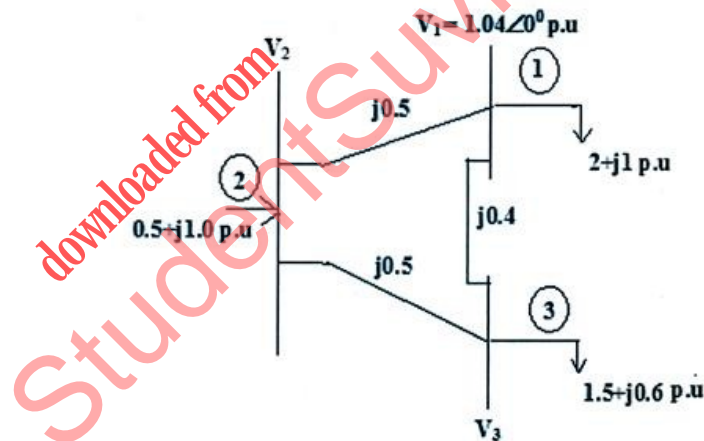
Answer any five questions
All questions carry equal marks

- 1.a) Explain the need for slack bus in load flow analysis.
b) For the three bus system whose Y_{BUS} is given below, calculate the second iteration value of V_3 using the Gauss-Seidel method. Assume bus 1 as the slack (with $V_1 = 1.0/0$), and buses 2 and 3 are load buses with a per unit load of ($S_2 = 1 + j0.5$) and ($S_3 = 1.5 + j0.75$). Use voltage guesses of $1.0/0$ at both buses 2 and 3. The bus admittance matrix for a three-bus system is

$$Y_{BUS} = \begin{bmatrix} -j10 & j5 & j5 \\ j5 & -j10 & j5 \\ j5 & j2 & -j10 \end{bmatrix}$$

[5+10]

2. A sample power system is shown in diagram. Determine V_2 and V_3 by N.R. method after one iteration. The P.U. values of line Impedances are shown in figure. [15]



3. Develop an iterative algorithm for solving the optimum dispatch equation of an 'n' bus power system by taking into account the effects of system losses. [15]

4. The fuel cost functions in Rs/hr for two thermal plants are given by:

$$C_1 = 420 + 9.2P_1 + 0.004P_1^2$$

$$C_2 = 350 + 98.5P_2 + 0.0029P_2^2$$

Where P_1, P_2 are in MW? Determine the optimal scheduling of generation if the total load is 640.82 MW. Estimate value of $\lambda = 12$ Rs/MWh. The transmission power loss is given by the expression $P_{RL}(pu)R = 0.0346P_1^2 + 0.00643P_2^2$. [15]

5. Draw the block diagram of a two area system and prove that the integral control reduces the static error in frequency and the line power flow to zero. [15]
- 6.a) Explain the effects of regulation and dead band on speed governor and automatic generation control.
- b) Two alternators rated for 110 MW and 210 MW have a governor droop characteristic of 5% from no load to full load. They are connected in parallel to share a load of 250MW. Determine the load shared by them. Assume free governor operation. [8+7]
- 7.a) Differentiate between steady state and transient stability of a power system. Discuss the factors that affect them.
- b) Explain the step by step method of solving the swing equation. Compare it with equal area criterion method. [7+8]
8. Explain the hardware components and functional aspects of SCADA system using a fundamental block diagram. [15]

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