

Code No: 156CK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, February - 2023

POWER SYSTEM OPERATION AND CONTROL

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.
 ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
 iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

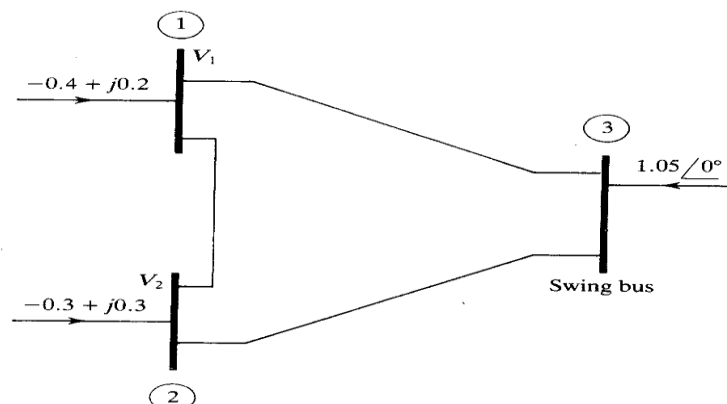
- 1.a) What is the need for load flow studies? [2]
- b) Explain the merits of N-R (Newton-Raphson) method. [3]
- c) Define current distribution factor. [2]
- d) Explain (i) Incremental fuel rate curve (ii) Incremental cost curve. [3]
- e) What is Q-V control channel? [2]
- f) What are the basic requirements of a load frequency control? [3]
- g) What is voltage stability? [2]
- h) Explain the terms: (i) critical clearing angle (ii) critical clearing time. [3]
- i) What is power system monitoring? [2]
- j) Explain the concept of load dispatch centre. [3]

PART – B

(50 Marks)

2. For the system shown in figure below, with bus 3 as reference bus, the bus impedance matrix is given by Start with $V_1^{(0)} = V_2^{(0)} = 1.05 \angle 0^\circ$, and solve for V_1 and V_2 by the Gauss-Seidel method. [10]

$$\mathbf{Z}_{\text{bus}} = \begin{bmatrix} 1.33 + j1.33 & 1 + j1 \\ 1 + j1 & 1.5 + j1.5 \end{bmatrix} \times 10^{-2} \text{ pu}$$



OR

3. With a neat flow chart, explain the load flow solution by Newton-Raphson method. [10]
4. Derive the transmission line loss formula for a system consisting of n- generating plants supplying several loads interconnected through a transmission network. [10]

OR

- 5.a) What is penalty factor in economic scheduling? Explain its significance?
- b) In a two plant system, the entire load is located at plant 2, which is connected to plant 1 by a transmission line. Plant 1 supplies 100 MW of power with a corresponding transmission loss of 5MW. Calculate the penalty factors for the two plants. [5+5]
6. Discuss the dynamic interaction between P-f and Q-V loops. [10]

OR

7. Derive the model of a speed governing system and represent it by a block diagram. [10]
- 8.a) State and explain equal area criterion.
- b) Discuss the step by step solution of a swing equation. [4+6]

OR

- 9.a) The power angle characteristic for a generator supplying infinite bus is given by $P_e = 1.25 \sin\delta$. The H constant is 5 sec and initially it is delivering a load of 0.5 p.u. Find the critical clearing angle.
- b) What are the various methods of improving steady state stability? Explain. [5+5]
10. Briefly explain the major components of a SCADA system. [10]

OR

11. What is the importance of load forecasting? Explain various techniques of load forecasting. [10]

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