

Code No: 156CK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, February/March - 2022

POWER SYSTEM OPERATION AND CONTROL

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

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- 1.a) Explain the necessity of a load flow solution. Derive the necessary equations for the load flow problem.
- b) Explain the Newton Raphson Load flow method in polar form, and derive the equations to compute the Jacobian matrix elements. [8+7]
- 2.a) What is meant by optimal generation allocation? Derive the conditions for optimal allocation of generation among the generators in a thermal plant including transmission losses.
- b) A power system consists of two 200MW units whose input cost data are represented by the equations:  $C_1 = 0.03P_1^2 + 21P_1 + 750$  Rs/hour,  $C_2 = 0.5P_2^2 + 18P_2 + 980$  Rs/hour. If the total received power  $P_R = 350$  MW, determine the load division between the units for the most economic operation. [7+8]
3. For a single area system, show that the static error in frequency can be reduced to zero for single area load frequency control with integral control. [15]
- 4.a) Why transient state stability limit is less than the steady-state stability limit? Explain.
- b) Derive an expression for critical clearing angle for a power system consisting of a single machine supplying an infinite bus for sudden load decrement. [8+7]
- 5.a) What are the functions of SCADA? With a detailed diagram, describe the hardware components of SCADA as well as their functionalities.
- b) What is EMS? What are its major functions in power system operation and control? [7+8]
6. Explain the fast decoupled load flow algorithm. List out all the assumptions made in arriving at it from decoupled load flow. [15]
7. Explain the significance of equality and inequality constraints in the economic allocation of generation among different plants in a system. [15]
8. How is the speed governor mechanism modeled? And explain its operations with the speed load characteristics. [15]

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