R18

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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