

Eighth Semester B.E. Degree Examination, July/August 2022
Power System Operation and Control

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

1.
 - a. What are the fundamental requirements of Power System Control? Explain with diagram, the various sub – system of a Power System. (08 Marks)
 - b. What is an Energy Control Center? List the interfaces and equipment available to the operator. (08 Marks)
 - c. What are Tie – Lines? Why tie – lines are employed in Power System (04 Marks)
2.
 - a. Define the Area – Control Error and explain the parallel operation of generators with different regulations. (08 Marks)
 - b. Explain the functions of Basic Generator Control Loops. (04 Marks)
 - c. Derive the exciter and generator linear models and draw the AVR closed loop block diagram. (08 Marks)
3.
 - a. Explain with a neat diagram, the speed governing system of a Turbine - generator. (07 Marks)
 - b. Explain the Integral Control Action, with a closed ALFC loop block diagram. (07 Marks)
 - c. A 2GW control area – 1 is interconnected with a 10GW area – 2. The area – 1 has the system parameters $R_1 = 2.4 \text{ Hz/pu MW}$ and $D_1 = 8.33 \times 10^{-3} \text{ pu MW/Hz}$. Area – 2 has the same parameters, but in terms of 10GW base. A 20MW load increase takes place in area – 1. Find the frequency drop and tie – line power change. (06 Marks)
4.
 - a. Explain the method of Voltage control by Injection of reactive power. (08 Marks)
 - b. With relevant diagram, explain the Voltage collapse. (05 Marks)
 - c. For the system shown in Fig. Q4(c), at a particular system load, the line voltage of busbar M falls below its nominal value by 5kV. Calculate the magnitude of the reactive Volt – ampere injection required at M to restore the original voltage. The p.u values are expressed on a 500MVA base. (07 Marks)

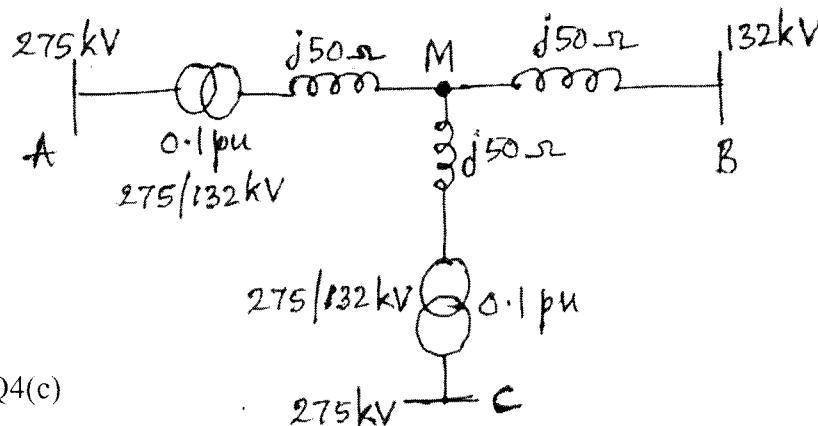


Fig. Q4(c)

PART – B

- 5 a. What is an Unit Commitment Problem? What are the different constraints that can be placed on the Unit Commitment Problem? (05 Marks)
- b. Explain the role of Spinning reserve in Unit Commitment Problem. (05 Marks)
- c. Draw and explain the Forward Dynamic Programming flow chart, for the solution of Unit Commitment problem. (10 Marks)
- 6 a. Explain with an example, the Security Constrained Optimal Power flow function of Power System Security. (08 Marks)
- b. Briefly explain the Security Analysis. (06 Marks)
- c. Explain the Contingency Selection Procedure, using Performance Index. (06 Marks)
- 7 a. Explain the Weighted Least Squares Estimation method of Power System State Estimation. (10 Marks)
- b. Explain i) Sources of error in State Estimation ii) Detection and Identification of bad data. (10 Marks)
- 8 a. Define the Reliability Index – The Mean time between the failures and derive the expression for general reliability. (08 Marks)
- b. With flow diagram, explain the loss of Load probability. (08 Marks)
- c. Explain Planned outage and Forced outage in the generating system. (04 Marks)
