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06EE82

Eighth Semester B.E. Degree Examination, December 2010
Power System Operation and Control

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least two from each part.***

Part - A

1 a. What is energy control center? Discuss the functions of energy control center. **(08 Marks)**

b. Explain with a neat block diagram the digital computer configuration of the SCADA systems. **(08 Marks)**

c. Two areas A and D are interconnected. The generating capacity of area A is 36000 MW and its regulating characteristic is 1.5% of capacity per 0.1 Hz. Area D has a generating capacity of 400 MW and its regulating characteristic is 1% of capacity per 0.1 Hz. Find each area's share of a +400 MW disturbance (increase in load) occurring in area D and the resulting tie-line flow. **(04 Marks)**

2 a. Explain the objectives and functions of Automatic Generation Control (AGC) in a power system. **(10 Marks)**

b. Describe the function of AVR with a neat block diagram. **(10 Marks)**

3 a. Explain how mathematical model of speed governing system is developed for automatic generation control. **(10 Marks)**

b. Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that the generators are operating at 50 Hz at no load, how would a load of 600 MW be shared between them? What will be the system frequency at this load? Assume free governor operation. Repeat the problem, if both governors have a droop of 4%. **(10 Marks)**

4 a. Explain how the voltage control is achieved by injection of reactive power at nodes. **(10 Marks)**

b. What is voltage instability? Explain the phenomenon of voltage collapse with relevant PV and QV diagrams. **(10 Marks)**

Part - B

5 a. Derive an expression for transmission loss as a function of plant generation. Also list the assumptions made in deriving the expression. **(12 Marks)**

b. Fig. Q5 (b) (on next page) shows a system having two plants 1 and 2 connected to buses 1 and 2 respectively. There are two loads and a network of four branches. The reference bus with a voltage of $1.0\angle 0$ P.U. is shown on the diagram. The branch currents and impedances are:

$I_a = 2 - j0.5$ P.U; $Z_a = 0.015 + j0.06$ P.U

$I_b = 1.6 - j0.4$ P.U; $Z_b = 0.015 + j0.06$ P.U

$I_c = 1.0 - j0.25$ P.U; $Z_c = 0.01 + j0.04$ P.U

$I_d = 3.6 - j0.9$ P.U; $Z_d = 0.01 + j0.04$ P.U

Calculate the loss formula co-efficients of the system in P.U. and in reciprocal MW, if the base is 100 MVA. **(08 Marks)**

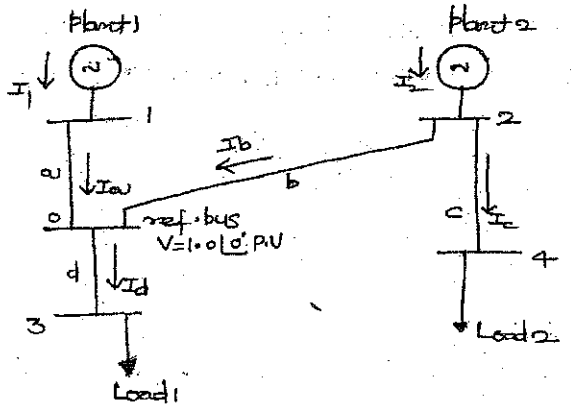

Fig. Q5 (b)

6 a. With the help of a flow chart, explain the dynamic programming method in unit commitment. **(10 Marks)**

b. Explain the problems and constraints found in unit commitment. How they are solved? **(10 Marks)**

7 a. Define system security and explain major functions involved in the system security. **(10 Marks)**

b. Explain briefly the factors affecting the system security. **(05 Marks)**

c. Explain briefly the problem of detection of network problems. **(05 Marks)**

8 a. Explain contingency analysis with the help of flow chart. **(10 Marks)**

b. Explain the sensitivity method of contingency evaluation. **(10 Marks)**

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