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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; June - 2017

Power System Operation and Control

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. What is a SCADA system? Explain with neat block diagram, the digital computer configuration for the SCADA systems. 10

b. What is Agc for a Power system? Explain briefly. 10

2 a. Explain the parallel operation of generators of Agc, with relevant droop characteristics. 12

b. Explain the necessity of control of power systems and also explain Area Control Error (ACE). 8

UNIT - II

3 a. Explain with a neat diagram, the basic generation control loop of Agc. 10

b. Briefly explain the static performance of the single area control system and obtain its expressions. 10

4 a. Explain in detail the block diagram representations of a two area system. 14

b. Determine the primary ALFC loop parameters (Kp and Tp) for a control area having the following data :

Total area capacity, P_r = 2000 MW, normal operating load, $P_D^0 = 1000\ MW$,

Inertia constant = 5.05, frequency, f° = 60 c/s, Regulation, R = 2.4 Hz/pu MW. 6

UNIT - III

5 a. Explain the generation and absorption of reactive power. 10

b. In a radial transforming system shown in Fig. 5(b), all p.u. values are referred to the voltage buses shown and on 100 MVA. Determine the power factor at which the generator must operate and total / active and reactive power supplied by generator.

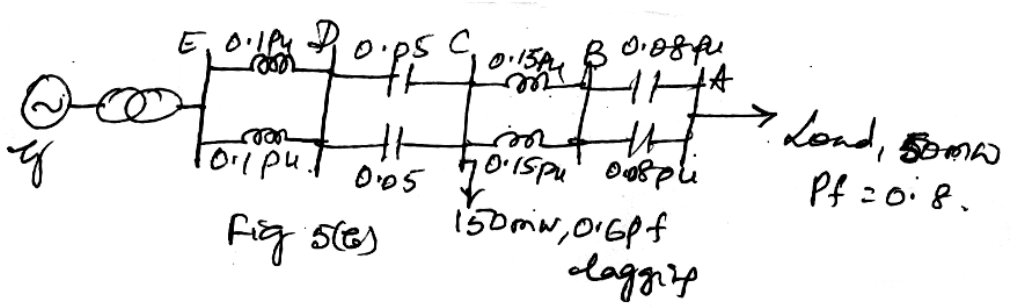


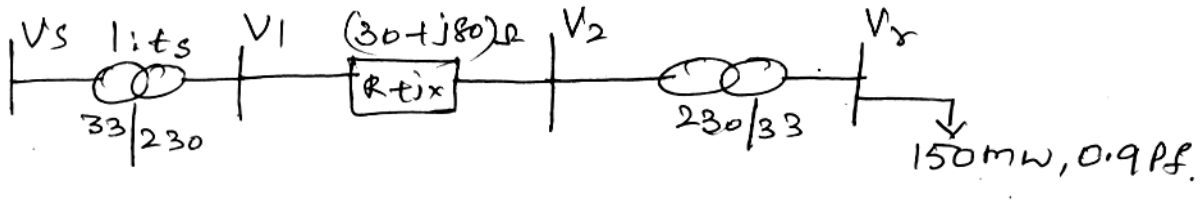
Fig 5(b) 10

6 a. Explain the following : 10

i) Voltage stability ii) Voltage collapse.

Contd…2

b. A 230 V line is fed through 33/230 kV transformer from a constant 33 kV supply. A single line diagram of 3 phase system is shown in Fig. 6(b), the impedance of the line and transformer at 230 kV is (80+j80) Ω, both the transformer are equipped with tap changing facility which are so arranged that the product of half nominal setting as unity. If the load on the system is 50 MW at 0.9 p.f. Determine the setting of tap changes required to maintain the voltage of load busbar at 33 kV. 10



UNIT - IV

7 a. Discuss the problem of unit commitment in optimal power system operation. Mention its constraints. 10

b. Incremental fuel cost in Rs/MW Hr for a plant consisting of 3 units are as follows :
$I_{C1} = 0.2p_{g1} + 40$ Rs/MW hr, $I_{C2} = 0.25p_{g2} + 30$ Rs/MW hr and $I_{C3} = 0.3p_{g3} + 20$ Rs/MW hr.
Assume that the all units are operating all the time and the total load is 400 MW. The minimum and maximum loads on each unit are 20 MW and 150 MW respectively. How the loads of 400 MW are be shared among these units for optimal operation. The system 'λ' values for minimum and maximum load on each units are : 10

Units	λ (20 MW)	λ_1(150 MW)
1	44	70
2	35	67.5
3	20	65

8 a. What are the different methods of solving unit commitment problem? Explain any one method briefly. 10

b. Explain the spinning reserve and thermal constraints. 10

UNIT - V

9 a. Define the steady state security of power system. Explain the importance of power system security analysis brining out the factors affecting the security. 12

b. What are the various states of operation of power system? 8

10 a. Explain briefly what are the problems of detection of network problem? Explain contingency analysis. 10

b. What are the credible contingencies? Explain any one method of contingency evaluation. 10

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