

Government College of Engineering, Aurangabad
(An Autonomous Institute of Government of Maharashtra)

B.E. (EEP) Examination-FT
End Semester Examination Nov. 2015

EE 444: POWER SYSTEM OPERATION AND CONTROL

Time: Three Hours

21 NOV 2016

Max. Marks: 60

"Verify the course code and check whether you have got the correct question paper"

N.B:-

1. All questions are compulsory.
2. Figures to the right indicates full marks
3. Assume suitable data if necessary and state it clearly
4. Use of non-programmable calculator is allowed
5. Draw neat labeled diagram wherever necessary

Q1. Attempt any Two (12)

- a) Derive power angle equation and hence draw and explain the power angle curve. Indicate the regions of stable operation for synchronous generator and motor.
- b) Find graphically the steady state stability limit of a system consisting of a generator of equivalent reactance 0.90 unit connected to infinite bus thro' a series reactance of 1.4 unit. Terminal voltage of the generator is held at 1.1 units and that of infinite bus is held at 1.00 unit.
- c) Explain construction of Clarke diagram for the system consisting of transmission network with resistance.

Q2. Attempt any Two (12)

- a) A generator, 50 Hz, delivering 50% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that decreases the maximum power that can be delivered to 40% of the original maximum value. After fault isolation occurs the maximum power that can be delivered is 80% of the original maximum value. Determine the critical clearing angle for the condition described.
- b) Point by point method-Discuss.
- c) Consider a synchronous generator connected to infinite bus. Derive the equation for critical clearing angle in case of a system for which mechanical input to the generator suddenly rises.

Q3. Attempt any Two (12)

Explain

- a) Typical arrangement of excitation system
- b) Automatic Voltage regulator-components. Duties of AVR
- c) Effect of type of fault, autoreclosure on transient stability

Q4. Attempt any One (12)

- a) State and explain the methods of reactive power control.
- b) Discuss- i) Load frequency control and ii) speed governing system

Q5. Attempt any Two

(12)

- a) Draw and explain the Input-Output, Heat rate and Incremental fuel cost curves in case of a thermal generating unit. Explain the interdependence.
- b) Explain the concept of multimachine stability
- c) The incremental costs in Rs. Per MW-hour of two 250 units are

$$\frac{dC_1}{dP_1} = 0.18 P_1 + 45$$

and

$$\frac{dC_2}{dP_2} = 0.24 P_2 + 50$$

The minimum load of each is 30MW. Find the load division between the two units as the total load is 400 MW.