

7E4175

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B.Tech. (Sem.VII) (Main/Back) Examination- Dec. 2013
Electrical Engineering
7EE5 Power System Engineering

Time : 3 Hours

Total Marks : 80
Min. Passing Marks : 24

Instructions to Candidates :

Attempt any five questions selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

UNIT - I

1. (a) Prove that the incremental rate curve intersects the heat rate curve at its minimum value. (8)
(b) Discuss different type of system constraints in detail. (8)

OR

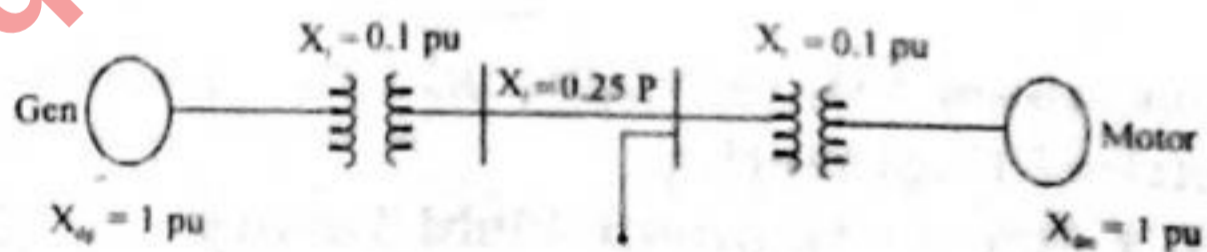
1. (a) Describe the dynamic programming solution for unit commitment. (8)
(b) A system consists of two plants connected by a transmission line as shown in figure. The load is at plant 2. The transmission line loss calculations reveal that a transfer of 100 MW from plant 1 to plant 2 means a loss of 15 MW. Find the required generation at each plant for $\lambda = 60$. Assume that the incremental costs of the two plants are given by-



$$\frac{dC_1}{dP_1} = 0.2 P_1 + 22 \text{ Rs./ MW-hr} ; \frac{dC_2}{dP_2} = 0.15 P_2 + 30 \text{ Rs./ MW-hr} \quad (8)$$

UNIT - II

2. (a) Distinguish between steady state, transient and dynamic stability. (6)
(b) In the system shown in Fig., a three-phase static capacitive reactor of reactance 1 pu per phase is connected through a switch at motor bus bar. Calculate the limit of steady state power with and without reactor switch closed. Recalculate the power limit with capacitive reactor replaced by an inductive reactor of the same value. Assume the internal voltage of the generator to be 1.2 pu and that of the motor to be 1.0 pu

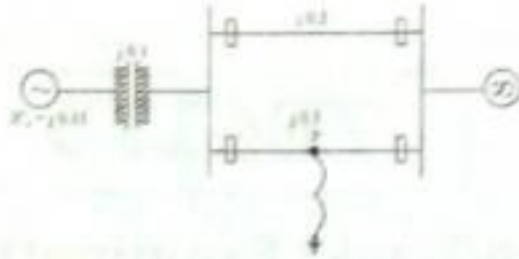


OR

2. (a) Find the steady state power limit of a system consisting of a generator equivalent reactance 0.50 pu connected to an infinite bus through a series reactance of 1.0 pu. The terminal voltage of the generator is held at 1.20 pu and the voltage of the infinite bus is 1.0 pu. (10)
(b) What conditions are to be satisfied for stable operation of a generation? (6)

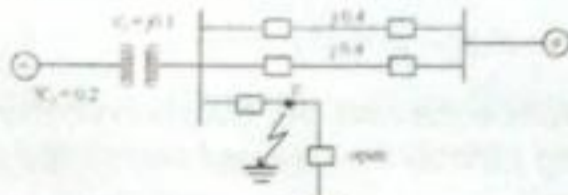
UNIT - III

3. (a) Find out equation for critical clearing angle if an auto reclose circuit breaker is used in a system having two transmission lines in parallel and a fault occurs at the mid point of one of the parallel lines. (8)
(b) For the system shown in fig., both the terminal voltage and infinite bus voltage are 1.0 pu and the generator is delivering 1.0 pu power. Calculate the critical clearing angle and the critical clearing time when the system is subjected to a 3 - phase fault at point P (middle of the line) as shown in fig. Let $H = 5 \text{ MJ/MVA}$ (8)



OR

3. (a) What are the factors which affect power system stability and methods to improve stability.
 (b) In the system shown (figure), the generator is delivering 1 pu power. The voltage behind transient reactance is 1.05 pu and infinite bus voltage is 1 pu the number on the diagram are the pu reactance on a common system bus. Calculate δ_{cr} and t_{cr} when the system is subjected to a 3- ϕ fault of point P. Take $H = 5$ MJ/MVA and $f = 50$ Hz.



UNIT-IV

4. (a) What are the advantages and disadvantages of interconnected power systems.
 (b) Why reserve capacity is required at generating stations? What are various types of reserve capacities used in power systems?

OR

4. (a) What are the types of excitation systems? Draw the functional block diagrams of them and briefly describe the various elements of the block diagrams
 (b) Write short note on Power System Interconnection in India.

UNIT-V

5. (a) Explain voltage instability problem in power system.
 (b) Explain working and uses of phase shifting transformer.

OR

5. (a) What are the different methods of voltage control in a power system? Explain the working of an on load tap changer transformer with the help of a diagram.
 (b) Write short note on power system security.

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