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Total No. of Questions : 08

M.Tech.(EE) (2013 Onwards)/(Power System) (2013 & Onwards)
(Sem.–1)

POWER SYSTEM ANALYSIS AND DESIGN

Subject Code : MTEE/MTPS-101
M.Code : 70725

Time : 3 Hrs. Max. Marks : 100

INSTRUCTION TO CANDIDATES :
1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carry TWENTY marks.

Q1. a) What is an Optimal Power Flow problem? Discuss its problem formulation. State the application of gradient method to obtain OPF solution. (10)

b) Compare the various methods to obtain load flow solution. (10)

Q2. Explain with a five bus system, the Z-bus building algorithm to construct the Z- bus of the assumed power system network with atleast one pair of mutually coupled lines. (20)

Q3. a) Discuss the application of Thevenin's theorem to solve the network exposed to three phase symmetrical fault. (10)

b) What are the various buses that exist in a power system network? Discuss the role of each bus. How is voltage controlled bus different from a PV bus? (10)

Q4. a) A 6.6kV, 10MVA, 3-phase turbo-generator has the following data :

Sub-transient reactance = 0.13pu, transient reactance = 0.25pu, synchronous reactance = 1. 5pu. A dead short circuit fault involving all the tree phases of the generator occurs at its terminals. Calculate

(i) the initial symmetrical (rms) short circuit current

(ii) the initial asymmetrical (peak) short circuit current

(iii) the maximum possible dc component of the short circuit current. (5)

b) Three non-reactive resistors 15, 25 and 30 Ohms are connected in star to the terminals a, b and c of a 440V, 3-phase, 3-wire supply. Find (i) all the line currents (ii) the voltage between star point and neutral, (iii) Two 1-phase wattmeters with current coils in lines a and c are connected to measure total power. Calculate the readings of these wattmeters. Phase sequence is abc. (5)

c) Discuss the modelling of tap-changing transformer and alternator. (10)

Q5. a) Show the interconnection of sequence networks for a L-L-G fault occurring in a power system network. Derive the relevant results. (10)

b) A 10MVA, 7kV star connected generator has positive, negative and zero sequence reactances of 28, 22 and 8% respectively. An inductive reactor with 7% reactance based on the rating of the generator is placed in the line from neutral to ground. For a L-L fault at the generator terminals when it is operating at rated voltage and is disconnected from the system determine, (a) initial symmetrical *r.m.s.* line and neutral currents and (b) line to line and line to neutral voltages. (10)

Q6. a) What are symmetrical components? Prove that symmetrical component transformation is power invariant. (10)

b) Discuss the contingency analysis for power systems using Brown's method. (10)

Q7. What do you understand by state estimation? In what application areas state estimation concepts are beneficial? How can the bad measurements be measured and identified? Write the weighted least squares method used for state estimation. (20)

Q8. Write short notes on the following :

a) Modeling of phase-shifting transformer (5)

b) Causes and remedies of bad estimation (5)

c) Fast Decoupled Load flow method (5)

d) Formation of network matrices using singular transformation (5)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.