

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (OLD) - EXAMINATION – SUMMER 2017****Subject Code: 150902****Date: 12/05/2017****Subject Name: Power System Analysis and Simulation****Time: 02:30 PM to 05:00 PM****Total Marks: 70****Instructions:**

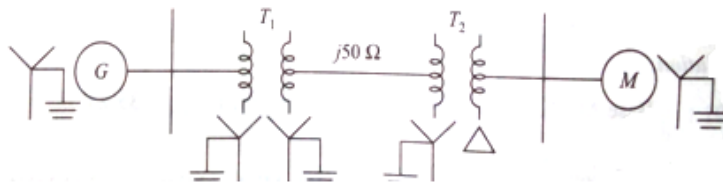
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a) With the help of vector diagram, explain how voltage at the sending end can be found out for medium length lines represented by nominal-T representation 07
- (b) Derive the expression for ABCD constants for long transmission line 07
- Q.2 (a) Determine the efficiency and sending end voltage of a 3-phase, 50 Hz transmission line delivering 20 MW at a pf of 0.8 lagging and 66 kV to a balanced load. Line inductance and capacitance is 111.7 mH and 0.9954 μ F respectively. Line resistance is 10 Ω . Use nominal- π method. 07
- (b) Discuss per-unit representation of a transformer. Explain how p.u impedance of a transformer remains same whether computed from primary or secondary side. 07

OR

- (b) Draw the per unit reactance diagram for the power system shown in Figure 1. Neglect resistance and use a base of 100 MVA, 220 kV in the 50 Ω line. The ratings of generator, transformer and motor are as follows: 07

G: 40 MVA, 25 kV, $X'' = 20\%$
 M: 50 MVA, 11 kV, $X'' = 30\%$
 T1: 40 MVA, 33Y/220Y kV, $X = 15\%$
 T2: 30 MVA, 11 Δ /220Y kV, $X = 15\%$



Determine the new p.u. values and draw the p.u reactance diagram

- Q.3 (a) Explain the concept of sub-transient, transient and steady state reactance. 07
- (b) Discuss the criteria for selection of circuit breakers 07
- OR**
- Q.3 (a) Explain resonant grounding method for neutral earthing. 07
- (b) What are earthing transformers? Explain how they are connected in power systems? 07
- Q.4 (a) Derive the expression for average 3-phase power in terms of symmetrical components. 07
- (b) The line currents in amperes in phases a,b, and c are $500 + j150$, $100 - j600$ and $-300 + j600$ referred to the same reference vector Find I_{a1} , I_{a2} and I_{a0} . 07
- OR**
- Q.4 (a) Derive the expression for positive, negative and zero sequence impedance of a fully transposed three phase transmission line 07
- (b) State the different factors affecting corona loss. 07

- Q.5 (a) Explain how the value of fault current can be computed for L-L-G fault occurring at the terminals of an unloaded synchronous generator. 07
- (b) A three phase generator rated 11 kV, 20 MVA has solidly grounded neutral. Its positive, negative and zero sequence reactances are 60%, 25% and 15% respectively. (i) Determine the value of reactance that should be placed in generator neutral so that current for single line to ground fault does not exceed the rated current (ii) What should be the value of resistance in the neutral to achieve the same purpose? 07

OR

- Q.5 (a) Prove that a wave travelling on a lossless overhead transmission line travels at the speed of light. 07
- (b) Explain how travelling voltage and current waves get attenuated on a transmission line 07

