Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- Vth SEMESTER–EXAMINATION – MAY/JUNE - 2012

Subject code: 150902 Date: 02/06/2012

Subject Name: Power System Analysis and Simulation

Time: 02:30 pm – 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) Draw the equivalent network of uniform long line and derive its π model. 07

(B) Using the nominal π method, find the sending end voltage and voltage regulation of a 250 km,3-phase, 50 Hz transmission line delivering 25 MVA at 0.8 powerfactor (lagging) to a balanced load at 132 kv. The line conductors are spaced equilaterally 3 m apart. The conductor resistance is 0.11 ohm/km and its effective diameter is 1.6 cm. Neglect leakages. 07

Q-2 (A) The voltage across a 3-phase unbalanced load are Va =200/_40^0, Vb = 320/_190^0, Vc=480/_340^0. Determine the symmetrical components of voltages. Phase sequence is abc. 07

(B) Write a brief note on phase shift of symmetrical components in Y-Δ transformer banks. 07

OR

(B) Fig.(A) shows a power system network. Draw zero sequence networks for this system. The system data is as under. 07

Generator (G1): 50 MVA, 11KV, X_0 =0.08 p.u.
Transformer (T1): 50 MVA, 11/220 KV, X_0 =0.1 p.u.
Generator (G2) : 30 MVA, 11KV, X_0 =0.07 p.u.
Transformer (T2): 30 MVA, 220/11 KV, X_0 =0.09 p.u.
Zero sequence reactance of line is 555.6 Ω

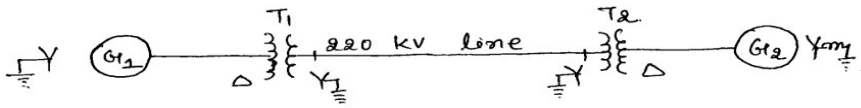

Fig (A)

Q-3 (A) Derive the double line to ground fault in a 3 phase alternator 07

(B) An unloaded star connected solidly grounded 10 MVA, 11KV generator has positive, negative and zero sequence impedances are j1.3 Ω, j0.8 Ω, and j0.4 Ω respectively. A single line to ground fault occurs at the terminals of the generator. 07

(1) Calculate the fault current.
(2) Determine the value of the inductive reactance that must be inserted at the generator neutral to limit the fault current to 50% of the value obtained in (1).

OR

Q-3 (A) Write a brief note on selection of circuit breaker. 07

(B) A synchronous generator and a synchronous motor each rated 25MVA, 11KV having 15% subtransient reactance are connected through transformer and a line as shown in fig.(B). 07

The transformer s are rated 25 MVA, 11/66KV and 66/11 KV with leakage reactance of 10% each. The line has a reactance of 10% on a base of 25 MVA, 66 KV. The motor is drawing 15 MW at 0.8 powerfactor leading and a terminal voltage of 10.6 KV when a symmetrical three- phase fault occurs at the motor terminals. Find the subtransient current in the generator, motor and fault.

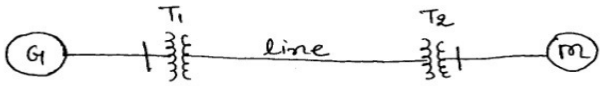

Fig (B)

Q-4 (A)	Discuss the advantages of per unit computations.	07
(B)	A generator is rated 1000 MVA, 33 KV. Its star connected winding has a reactance of 0.9 p.u. Find (1) Ohmic value of reactance of the winding if the generator is working in a circuit for which the bases are specified as 250MVA, 22KV (2) The p.u. value of reactance of generator winding on the specified base.	07

OR

Q-4 (A)	Explain travelling waves of a transmission line when the receiving end is shortcircuited.	07
(B)	Write a note on zero sequence networks in brief.	07
Q-5 (A)	Explain need of neutral grounding using phasor diagrams. Explain any one method of neutral grounding.	07
(B)	Starting from the first principles, show that surges behaves as travelling waves. Find expression for surge impedance and wave velocity.	07

OR

Q-5 (A)	Discuss factors affecting corona.	07
(B)	Find the critical disruptive voltage and corona loss for a 3 phase line which is operating at 220 KV, 50 Hz frequency. The line has conductor of 1.5 cm diameter arranged in a 3 meter delta connection. Assume air density factor of 1.05 and dielectric strength of air to be 21.1 KV/cm.	07