Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER V • EXAMINATION – WINTER - 2012

Subject code: 150902 Date: 12-01-2013

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)** What is importance of receiving end power circle diagram? Explain the steps of constructing it. **07**

(b) A three phase 50 Hz transmission line is 150 Km long and delivers 25 MW at 110KV at 0.85 p.f. lagging. The resistance and reactance of the line per conductor per kilometer are 0.3 Ω and 0.9 Ω respectively. The line charging admittance is 0.3×10^{-6} ʊ /km/phase. Compute the voltage regulation and transmission efficiency by applying nominal π method. **07**

Q.2 **(a)** A four bus sample power system is shown in fig 1.Calculate the fault current at bus no 4 for three phase solid fault occurring at that bus. Various data are given below. Assume pre fault voltage as 1.0 pu and pre fault current be zero. **07**

G1:11.2 KV,100 MVA, x'_{g1}=0.08 pu,
Line from 1 to 2=0.20 pu, Line from 1 to 3 =0.20 pu,
Line from 1 to 4=0.10 pu, Line from 2 to 3=0.10 pu,
Line from 2 to 4=0.10 pu,
G2:11.2 KV,100 MVA, x'_{g2}=0.08 pu
T1:11/110KV,100MVA, X_{T1}=0.06 pu
T2: 11/110KV,100MVA, X_{T2}=0.06 pu

(b) Discuss the effect of change in excitation of synchronous machine. **07**

OR

(b) What is importance of one line diagram of a power system? How it is drawn? **07**

Q.3 **(a)** Explain the importance of bus impedance matrix in fault calculation. **07**

(b) A 100 MVA, 33 KV three phase generator has a reactance of 15%. The generator is connected to the motors through transmission line and a transformer as shown in fig 2. Motors have rated inputs of 40MVA, 30 MVA, and 20 MVA at 30 KV with 20 % reactance each. Draw the P.U. diagram. **07**

OR

Q.3 **(a)** How the circuit breaker is selected for any particular location. **07**

(b) Explain steady state, transient and sub transient reactance of a synchronous machine. **07**

Q.4 **(a)** Explain the zero sequence impedance of transformer for various connections. **07**

(b) The currents in three phase unbalance system are I_R=(12+j6) A,I_Y=(12-j12) A, I_B = (-15+j10) A. The phase sequence is RYB. Calculate, positive, negative and zero sequence component of current. **07**

OR

Q.4 **(a)** Explain how fault current can be calculated when L-G fault occur through **07**

a fault impedance Z^f.

Q.4 **(b)** A 25 MVA, 13.2 KV alternator with solidly grounded neutral has a sub transient reactance of 0.25 p.u.. the negative and zero sequence reactances are 0.35 and 0.1 p.u. respectively. Find the fault current when (1) a single line to ground fault occurs at the terminals of an unloaded alternator (2) a L-L fault occurs. **07**

Q.5 **(a)** Explain how corona affect the electrical design of transmission line. State the factors on which corona loss depends. **07**

(b) The three phase 220KV, 50 Hz line is 250 Km long consisting of 22.26mm diameter conductor spaced in a 6 mt delta configuration. The following data can be assumed. **07**
Temperature 25^0 C, pressure 73 cm of mercury, surface factor 0.84, irregularity factor for local corona 0.72 , irregularity factor for general corona 0.82. Find the total loss in fair weather using Peek's formula.

OR

Q.5 **(a)** What are the various methods of neutral grounding? Explain any two. **07**

(b) Explain single and double frequency transient. **07**

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FIGURES

Fig.1 Q 2 (a)

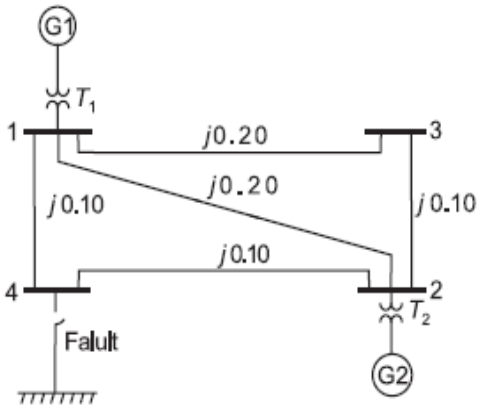
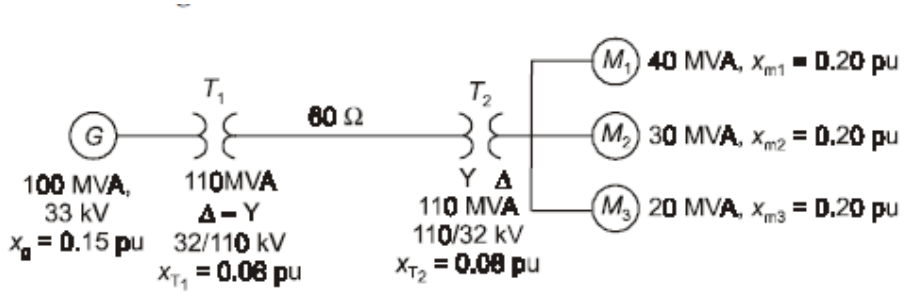


Fig.2 Q.3 (b)



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