FACULTY OF ENGINEERING

B.E. 3/4 (EEE) I-Semester (New) (Main) Examination, November / December 2012

Subject : **Power Systems - II**

Time : 3 Hours **Max. Marks: 75**

Note: Answer **all** questions of Part - A and answer any **five** questions from Part-B. Any missing data assume suitably.

PART – A (25 Marks)

1. For a medium length nominal Π transmission line draw the circuit and the phasor diagram for lagging power factor conditions. (2)

2. Obtain the exact condition for zero regulation for a short transmission line. (3)

3. List out the reasons to keep voltage at the consumer's terminals within prescribed limits. (2)

4. Show that the load voltage V_2 is not affected much due to the component of the load. (3)

5. What are the quantities whose vase values are required to represent the power system by reactance diagram? (2)

6. The generator emf is 1 p.u. and the subtransient reactance is 25%. Find the subtransient current. (3)

7. Draw the connection of sequence networks for line to ground fault through an impedance Z_r. (2)

8. Draw the vector diagram with the help of sequence components to obtain the phase voltages. (3)

9. Explain the reasons for not redistribution of currents and voltages instantaneously in a power system switchings. (2)

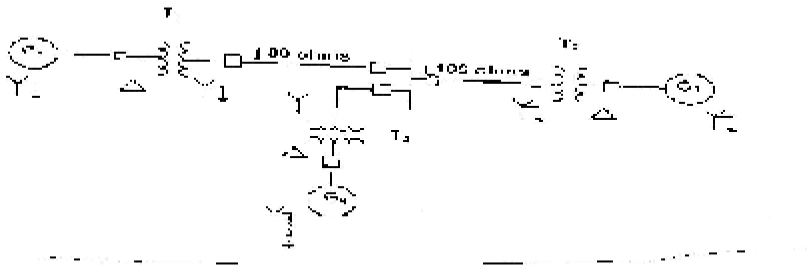
10. Explain why a traveling wave suffers reflection when it reaches a discontinuity. (3)

PART – B (5x10=50 Marks)

11. A three phase transmission line has a line resistance per phase of 6 ohms and a inductive reactance per phase of 12 ohms and the line voltage at the receiving end is 33 kV.
    (a) Determine the voltage at the receiving end when the load at the receiving end is 20 MVA at p.f. 0.8 lagging.
    (b) The voltage at the sending end is maintained constant by means of a synchronous phase modifier at the receiving end which has the same rating at zero load at the receiving end as for full load of 15 MW. Determine the p.f. of the full load output and rating of the synchronous phase modifier. (10)

12. Along with its advantages and disadvantages explain the following (with necessary diagrams): (10)
    (a) Static Var compensator
    (b) Induction regulator

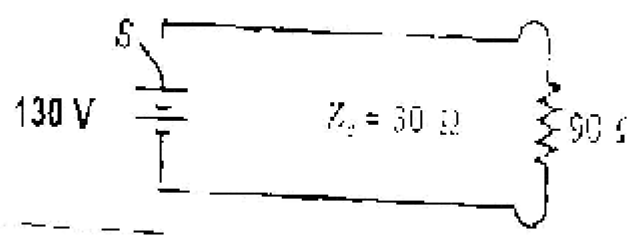
13. The single line diagram of an unloaded power system is shown in below figure. The generator and transformers are rated as follows:
G_1=22MVA, 13.8 kV, X"=20% G_2=32MVA, 18 kV, X"=20%
G_3=30MVA, 20 kV, X"=20% T_1=25MVA, 220/13.8 kV, X=10%
T_2= 3 single phase units each rated at 10MVA, 127/18 kV, X=10%
T_3=35MVA, 220/22 kV, X=10%
Draw the reactance diagram using a base value of 50 MVA and 13.8 kV on the generator G_1.



Figure

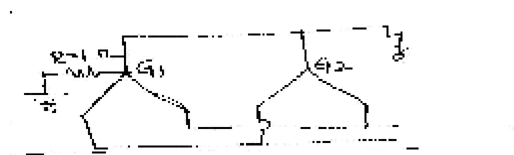
14. From fundamentals along with the necessary diagrams obtain the expressions for fault currents for a unloaded synchronous generator for the following types of faults. (assume the neutral is grounded through an impedance Z_n). (10)
(i) Double line to ground
(ii) Line to Line fault

15.(a) A dc source of 120 V with negligible resistance is connected through switch S to a lossless transmission line have Z_c=30 ohms. The line is terminated in a resistance of 90 ohms. If the switch closes at t = 0, plot V_R versus time until t = 5 T, where T is the time for a voltage wave to travel through the length of the line. (6)



(b) Define the surge impedance with reference to transmission line and deduce from the first principles an expression for its value. (4)

16. Two 11 kV, 12 MVA, 3-phase star connected generators operate in parallel as shown below. The positive, negative and zero reactances of each being j0.09, j0.05 and j0.045pu respectively. A single line to ground fault occurs at the terminals of one of the generators. Calculate (i) Fault current (ii) Voltage across the grounding resistor. (10)



17.(a) A three phase, star connected load is connected across a 3 phase balanced supply system. Obtain the set of equations relating the symmetrical components of the line and phase voltages. (4)
(b) In a 5 insulator disc string capacitance between each unit and earth is 1/6 of the mutual capacitance. Find the voltage distribution across each insulator in the string as % age of the voltage of the conductor to earth. Find the string efficiency.

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