Student Exam No._____

GANPAT UNIVERSITY
B.TECH SEM-VI ELECTRICAL ENGINEERING
REGULAR EXAMINATION- MAY-JUNE-2014
2EE 602 – POWER SYSTEM ANALYSIS

Time: 3 Hours
Total Marks: -70

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

Section-I

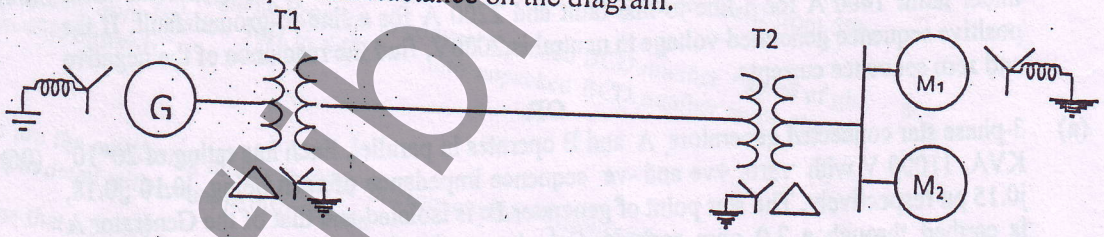
Que-1 (a) Explain the salient pole synchronous machine modeling with phasor diagram and also discuss the power angle curve. (05)

(b) A 120 MVA, 19.5 kV generator has Xs = 0.15 per unit and is connected to a transmission line by a transformer rated 150 MVA, 230 Y/18Δ kV with X = 0.1 per unit. If the base to be used in the calculation is 100 MVA, 230 kV for the transmission line, find the per unit values to be used for the transformer and generator reactance. (06)

OR

Que-1 (a) Discuss "Per-Unit system of representing quantities in power system analysis". (05)

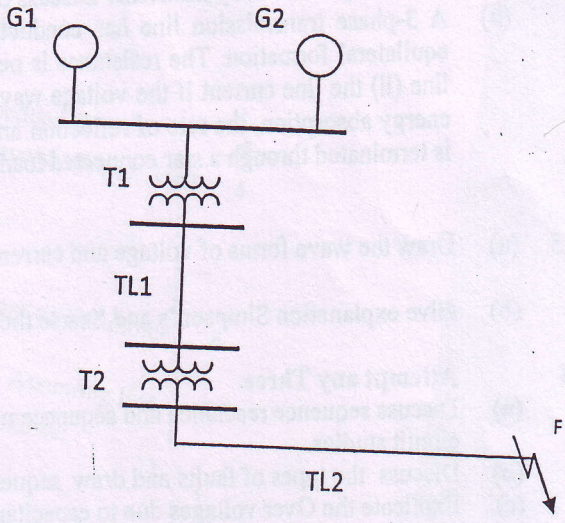
(b) Figure 3 shows a generator feeding two motors through transformers and line. The ratings and reactance are as under: **Generator** : 90 MVA, 10 kV, X = 25 % (06)
Transformer T_1 : 100 MVA, 10 / 132 kV, X = 6 %
Transformer T_2 : 90 MVA, 10 / 132 kV, X = 5 %
Motor M_1 : 50 MVA, 10 kV, X = 20 %; ; **Motor M_2** : 40 MVA, 10 kV, X = 20 %
Transmission line: X = 100Ω. Select generator rating as base values, draw reactance diagram and indicate per unit reactance on the diagram.



Que.2 (a) Explain step by step procedure of Z bus formulation by different type of modification . (06)

(b) A 3-phase balanced fault occurs at point F of the radial network shown in figure,. Determine the fault current and the line voltage at 11 kV bus under fault conditions. (06)

G_1 : 10 MVA, 11 kV, X = 15%:
G_2 : 10 MVA, 11 kV, X = 12.5%:
T1 : 10 MVA, 11/33 kV, X = 10% ;
TL1 : 30 km, Z = (0.27 + j 0.36) Ω/km :
T2 : 5 MVA, 33/6.6 kV, X = 8%,;
TL2 : 3 km, Z = (0.135 + j 0.08) Ω/km .



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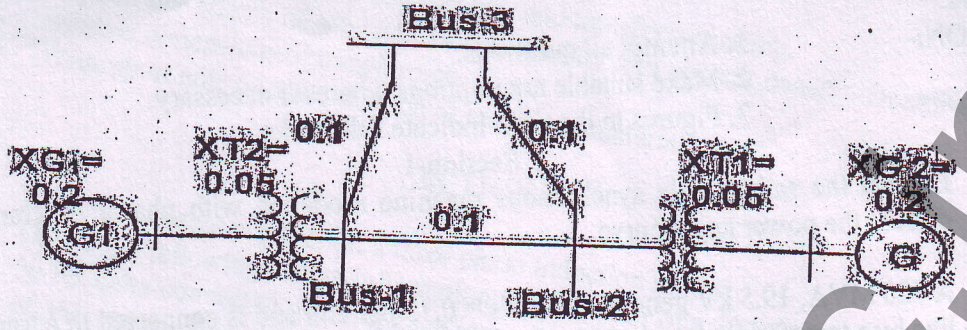
OR

Que.2 (a) Obtain sequence impedance matrix for transposed transmission line and comments on its sequence impedance values. (06)

Que-2 (b) Obtain Z-Bus matrix for power system shown in fig .Calculate fault current for solid 3 phase fault on bus 3 using Z bus. (06)



Que-3 **Attempt any four.** (12)

(a) Define OLD and discuss impedance and reactance diagram for power system network.

(b) (1)Define sub transient reactance and discuss its significance in short circuit studies.
(2)Discuss characteristic of Phase operator "a" used in fault analysis.

(c) Explain the sequence reactance of transformer in terms of symmetrical components.

(d) Write a short note: Selection of Circuit Breaker rating.

SECTION-II

Que-4 (a) Discuss the principle of symmetric components. Derive the necessary equations to convert phase quantities into symmetrical components. (06)

(b) A three phase generator with constant terminal voltages gives the following currents when under fault: 1400 A for a line-to-line fault and 2200 A for a line-to-ground fault. If the positive sequence generated voltage to neutral is 2000V, find the reactance of the negative and zero sequence currents. (06)

OR

Que-4 (a) 3-phase star connected generators A and B operates in parallel. Each has rating of $20*10^3$ KVA, 11000 V with zero, +ve and -ve sequence impedance of each being j0.10 ,j0.18, j0.15 pu respectively. The star point of generator B is isolated and that of the Generator A is earthed through a 2.0 ohm resistor. Calculate the fault current and current in grounding resistor if single line-to-ground fault occurs at the terminals of generator B. (06)

(b) Derive the expression for fault current in Line-to-Line fault on an unloaded generator in terms of symmetrical components. (06)

Que- 5 (a) What do you mean by transient? Discuss transient in circuit having R -L-C components. (05)

(b) A 3-phase transmission line has conductors 2cms in diameter spaced 1 meter apart in equilateral formation. The resistance is negligible. Calculate (i) natural impedance of the line (ii) the line current if the voltage wave of 33kV travels along the line (iii) the rate of energy absorption, the rate of reflection and the state and the form of reflection if the line is terminated through a star connected load of 1000 ohm per phase. (06)

OR

Que- 5 (a) Draw the wave forms of voltage and current for short circuited lines. (05)

(b) Give explanation Simpson's and Scarse theory for charge formation. (06)

Que-6 **Attempt any Three.** (12)

(a) Discuss sequence reactance and sequence network for synchronous generator used in short circuit studies.

(b) Discuss the types of faults and draw sequence network connection of line to ground fault

(c) Explicate the Over voltages due to capacitance switching and ferro resonance.

(d) A Surge of 100Kv travelling in a line of neutral impedance 600Ω arrives at a junction with two lines of impedances 800 Ω and 200 Ω respectively. Find the surge voltages and currents transmitted into each branch line.