(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 120611 Roll No. | | | | | | | | | | |

B. TECH.

Theory Examination (Semester-VI) 2015-16

POWER SYSTEM ANALYSIS

Time : 3 Hours ***Max. Marks : 100***

Section-A

1. Attempt all parts of the following. Each part has equal marks. (10×2 = 20)

(a) The neutral grounding impedance Zn appears as 3Zn in the zero-sequence equivalent circuit. Why?

(b) Give the function of current limiting reactors.

(c) Name the fault in which all the three sequence currents are present and are equal.

(d) Write the relationship between base KVA, base KV and percentage reactance?

(e) State Gauss-Seidel load flow formula.

(f) Mention the quantites specified and not specified at the reference bus defined for load flow study.

(g) Define stability of a power system.

(h) If the two machines with inertias M_1 and M_2 are swinging together, what will be the inertia of the equivalent machine?

(i) What is the effect of shunt capacitance at the terminal of a transmission line?

(j) What is meant by surge absorber?

Section-B

2. Attempt any five parts of the following. Each part carries equal marks. (5×10 = 50)

(a) Prove that zero sequence network is absent in case of ocurrence of double line fault through certain impledance in a power system network. Draw the zero sequence network for the system shown below in figure 1.

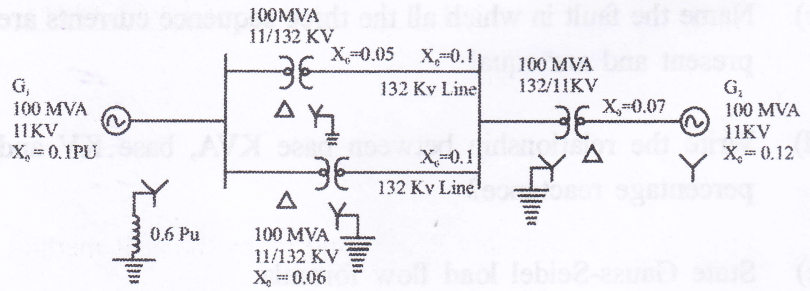


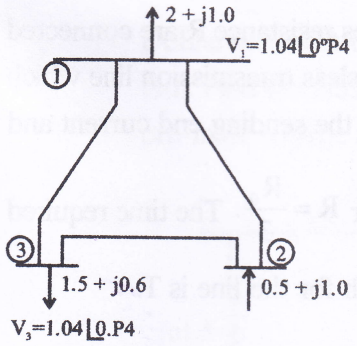
Fig. 1

(b) A 25 MVA, 13.2 KV alternator with solidly grounded, neutral has a subtransient reactance of 0.25. The negative - and zero - sequence reactances are 0.35 and 0.1 P.u. respectivelly. Determine the fault current and line to line voltages at the fault point when a double line to ground fault occurs at the terminals of the alternator.

Deduce also the expression used for calculating fault current.

(c) Develop the mathematical model for the load flow analysis of a power system using Gauss-Seidal method and discuss its solution algorithm.

(d) A 3-bus system is shown in figure-2 given below. The series impedance and shunt admittance of each line are (0.0197 + j 0.0788) PU and j0.04 pu respectively. The bus specification and power input etc. at the buses are given in the table.



Bus	P_G	Q_G	P_L	Q_L	Bus Voltage
1.	–	–	2.0	1.0	1.04L0°Pu
2.	0.5	1.0	–	–	Unspecified
3.	–	–	1.5	0.6	1.04L0°Pu

Fig. 2

Form Y_{bus} and calculate P_2°, Q_2° and P_3° by the N-R method.

(e) Discuss point-by-point method for solving swing equation for transient stability of a power system.

(f) A generator operating at 50Hz delivers 1pu power to an infinite bus when a fault occurs and reduces the maximum power transferable to 0.4pu. The maximum power transferable before the occurance of fault was 1.75pu. The maximum power transferable after clearance of fault is 1.25 pu. Compute critical clearing angles.

(g) Discuss the behaviour of a travelling wave when it reaches the end of a (i) short circuited (ii) open circuited transmission line (iii) a line terminated by an impedance equal to surge impedane.

(h) A battery with an emf E and series resistance R are connected at $t = 0$ to the sending end of lossless transmission line which is short circuited at far end. Plot the sending end current and voltage as the function of time for $R = \frac{R_0}{3}$. The time required for a wave to travel to full length for the line is T.

Section-C

Note: Attempt any two questions of the following. Each part carry equal marks. (15×2=30)

3. (a) Prove that per unit impedance of the transformer is independendent of side it is referred to. A generator is rated at 30MVA, 11KV and has a reactance of 20%. Calculate its per unit reactance for 50MVA, 10KV base. [8]

(b) What do you understand by reactance diagram? Discuss in detail. [7]

4. (a) Discuss the behaviour of an alternator when sudden 3-ϕ short circuit takes place at its terminals. Also explain the reactences X^{11}, X^{1} and X_s for it. [7]

(b) Define the short-circuit capacity of fault level in power system. Find the fault current in the figure 3 given below, if the pre-fault voltage at fault point is 0.97. [8]

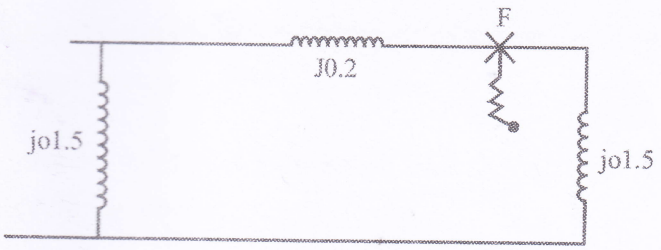


Fig. 3

5. Write short notes on :

(a) Equal Area Criterion. [5]

(b) Double line fault. [5]

(c) Methods of improving transient stability of a power system. [5]