Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech. (Makeup)

Branch	**: EEE**	**Semester**	**: 5th**
Title of the Course	**: Power System Analysis**	**Course Code**	**: EEL302**

Time: 3 Hours **Maximum Marks: 50**

Note: 1. Answer all the questions.

2. Do not write anything on the question paper except Roll number

3. Assume any data suitably if found missing

Section-I

Q-1 Explain the following terms clearly [1×10=10]

i. Swing Equation.
ii. Write all the sequence components for line current, I_a, I_b, I_c.
iii. Short Circuit Capacity.
iv. Coherent Machines.
v. Zero sequence circuit of Y-Δ transformer.
vi. Equivalent Sequence networks of alternator.
vii. I_a=4, I_b=5, I_c=6 all at same phase zero; Compute I_{a0}, I_{a1}, I_{a2}.
viii. Voltage Collapse.
ix. Small and large signal.
x. Power System Stability.

Section-II

Attempt any Four. Each carry equal marks [5]

Q-2 Find the equivalent circuit for the following 3-phase transformers.

i. Star-Star grounded
ii. Delta-Star grounded

Q-3 A balanced delta connected load takes 150 A from a balanced 3-phase 4-wire supply. If the fuse in two of the lines has been burned, find the symmetrical components of the line currents and delta currents for the following conditions (a) before and (b) after the fuses are burned.

Q-4 Find the equivalent circuit in following fault cases.

iii. Line to Ground
iv. Line to Line to Ground

Q-5 An 11kV, 25 MVA synchronous generator has positive, negative and zero sequence reactance of 0.12, 0.12 and 0.08 per unit, respectively. The generator neutral is grounded through a reactance of

0.03 per unit. A single line to ground fault occur at the generator terminals. Determine the fault current, phase voltages and line voltages. Assume that generator was unloaded before fault.

Q-6 Symmetrical components of an unbalance supply is as follows:

$V_{a0} = 30\angle -30^o V, V_{a1} = 450\angle 0^o V, V_{a2} = 225\angle 40^o V$

$I_{a0} = 10\angle 190^o A, I_{a1} = 6\angle 20^o A, I_{a2} = 5\angle 50^o A$

Determine the complex power represented by these voltage and currents by (a) symmetrical components (b) Unbalanced phase components.

Section-III
Attempt any Two. Each carry equal marks [10]

Q-7 Explain the following terms clearly

i. Transient Stability Analysis

ii. Steady State Stability Analysis

iii. Voltage Stability

Q-8 A radial system having a generator 100MVA, 25 kV, 50 Hz having sub-transient reactance of 18%, supplying a load of $250\Omega\angle 30$ at 23.8 kV via a transmission line having reactance of 85Ω. A 3 phase to ground fault occur at the load terminal with fault impedance 400Ω. Find the short circuit MVA, fault current and net current from the generator just after fault.

Q-9 Find the Y_{bus} for the following line data at the base of 100MVA, 230kV.

Line between Bus No.	Conductance (pu)	Susceptance (pu)	Shunt admittance (pu)
1-2	0.2	-j0.20	-
2-3	0.35	-j0.18	-j0.6
3-4	0.3	-j0.15	-
4-1	0.45	-j0.28	j0.5
1-3	0.6	-j0.30	-j0.8

Further modify the Y_{bus} if a line having admittance of (0.8-j0.1) pu is connected in between buses 2 to 4. For the obtained network, bus data is as follows:

Bus No	P_G (MW)	Q_G(MW)	P_D(MW)	Q_D(MW)	|V|(pu)
1	250	150	-	-	1
2	100	75	80	100	0.95
3	125	60	100	105	0.98
4	200	60	100	-	1.05

Using fast decoupled method determine the first iteration solution to the power flow problem.