BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : VI**
BRANCH: EEE **SESSION : SP/19**

SUBJECT: EE6203 POWER SYSTEMS-II

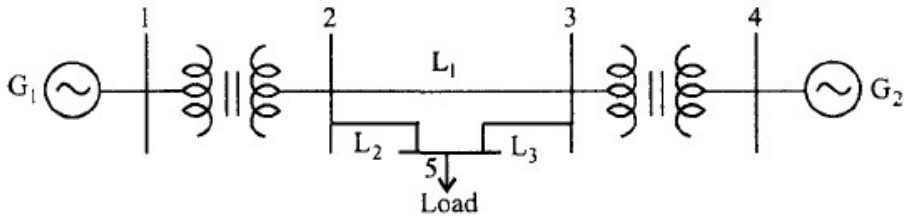
TIME: 3.00 Hrs. **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Define per unit quantity and write its unit? [2]

Q.1(b) A single phase transformer is rated at 110/440 V, 3 KVA. Its per unit reactance measured on primary side is 0.01239. Determine the leakage reactance in ohms as referred to secondary side? [4]

Q.1(c) Consider a power system where load (RL) at bus 5 is fed by generators at bus 1 and bus 4. The generators are rated at 100 MVA, 11 KV with subtransient reactance of 25%. The transformers are rated each at 100 MVA, 11/112 KV and have a leakage reactance of 8%. The lines have an inductance of 1mH/ phase/km. Line L1 is 100 km long while lines L2 and L3 are each of 50 km in length. Draw per unit reactance diagram. Choose 100 MVA and generator voltage as base values. [6]



Q.2(a) What are different types of buses and write the specified and unspecified quantities at each bus? [2]

Q.2(b) Derive the power flow equations? [4]

Q.2(c) Determine the voltages at the end of first iteration using Gauss Seidel method without using acceleration factor. The bus data, bus admittance matrix is given below [6]

Y_{BUS}		
-j39.9	j20	j20
j20	-j39.9	j20
j20	j20	-j39.9

Bus Code	P	Q	V	Remarks
1	-	-	1.06	Slack
2	0.5	0.2	-	PQ
3	0.4	0.3	-	PQ

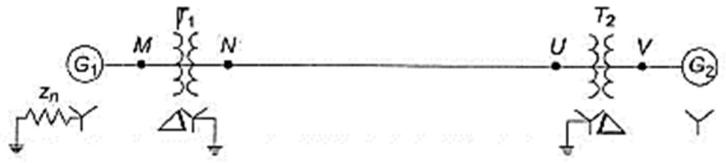
Q.3(a) Mention the reason of flowing high current and low voltage at the LG fault point of a network. [2]

Q.3(b) Consider an alternator rated at 25 MVA, 11 kV has subtransient reactance of 15% connected to a load rated 10.6 kV, 15 MW at 0.8 PF leading is subjected to 3 phase fault at load terminal. Determine the short circuit current in amperes? [4]

Q.3(c) Explain the effect of symmetrical short circuit on synchronous machine under no load conditions with equivalent circuits? [6]

Q.4(a) Why positive and negative sequence impedance of transmission line are same? [2]

Q.4(b) Sketch the zero sequence network for the power system whose single line diagram is given below. Use appropriate symbols for the various reactance's in the diagram. [4]



Q.4(c) In a 3-phase, 4 wire system, the currents in R,Y and B lines under abnormal conditions of loading are as follow $I_R = 100\text{at}30^\circ$ A $I_Y = 50\text{at}300^\circ$ A $I_B = 30\text{at}180^\circ$ A. Calculate the positive, negative and zero sequence current in the R- Line and return current in the neutral wire? [6]

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Q.5(a)	Find the expression for three phase power in terms of symmetrical components.	[2]
Q.5(b)	Derive the expression for fault current for a single line-to-ground fault in a power system faulted through fault impedance Zf.	[4]
Q.5(c)	Deduce and draw the sequence network for LLG fault at the terminal of unloaded generator.	[6]
Q.6(a)	Distinguish between steady state stability and dynamic stability.	[2]
Q.6(b)	What is swing equation? Derive the expression for swing equation for a synchronous machine connected to an infinite bus.	[4]
Q.6(c)	Find the energy stored in the rotor of a three phase, 50 Hz. 250 MVA turbo alternator with H=7.5 MJ/MVA. Determine the value of the inertia constant M. The generator is initially supplying a steady power of 150 MW. If the mechanical power input to the turbine is suddenly decreased to 100 MW, evaluate the initial acceleration of the rotor neglecting all losses. Assume 6 poles. Also find the rotor speed after 10 cycles.	[6]
Q.7(a)	Write any two measures to improve transient stability.	[2]
Q.7(b)	The power angle characteristic for a synchronous generator supplying infinite bus is given by e = 1.25 sinδ. The H constant is 5 sec and initially it is delivering a load of 0.5 p.u. Determine the Critical clearing angle.	[4]
Q.7(c)	Explain equal area criterion method and derive its equation.	[6]

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