BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VI ELECTRICAL :SUMMER- 2022
SUBJECT : POWER SYSTEM ANALYSIS

Day : Wednesday
Date : 15-06-2022

S-13327-2022

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY**
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
4) Assume suitable data if necessary.

Q.1 **a)** Derive and explain the concept of complex power. **(05)**

b) Explain real power-frequency and reactive power-voltage dependency in short. **(05)**

OR

Q.1 **a)** In the following circuit of fig.1(a), $V = 1000\angle 0^0$ V, $Z_1 = (50+j0)\Omega$, $Z_2 = (3+j10)\Omega$ and $Z_3 = (20 - j\ 20)\ \Omega$. Find the power absorbed by each load and total complex power. **(05)**

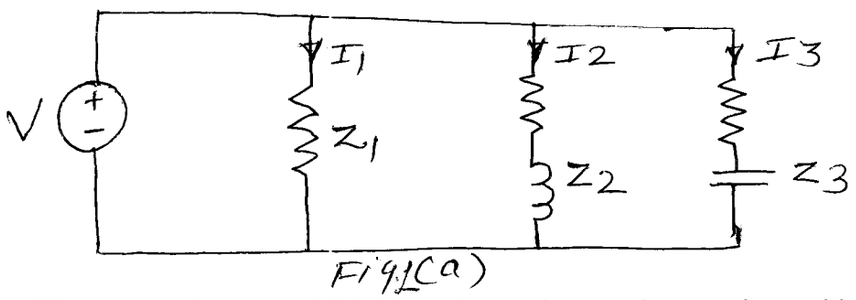

Fig.1(a)

b) What is complex power? Why complex conjugate of current is considered to evaluate complex power? **(05)**

Q.2 **a)** List the advantages and applications of single line diagram and per unit system. **(05)**

b) Derive synchronous generator simple model such as emf behind transient reactance. **(05)**

OR

Q.2 **a)** A three-phase synchronous generator delivers 10 MVA at a voltage of 10.5 KV. The line impedance is 5Ω. Determine the voltage drop in the line in per unit and in volts. Use the reference base as 12 MVA at 11 kV. **(05)**

b) Derive and sketch the model of three winding transformer. **(05)**

Q.3 **a)** Explain in short the concept and need of load flow analysis. **(05)**

b) Classify and explain different types of buses in power system for load flow studies. **(05)**

OR

Q.3 Fig.(3) shows the single line diagram of a simple four-bus system. Table (3) gives the line admittances identified by the buses on which theses terminate. The shunt admittance at the buses is assumed to be negligible. **(10)**

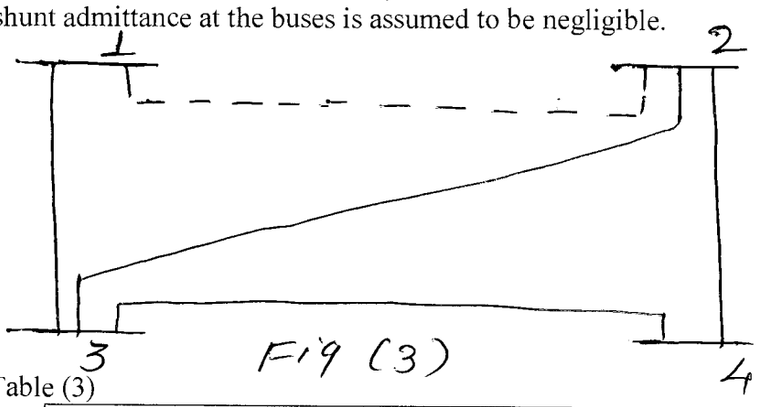

Fig (3)

Table (3)

Line, bus to bus	G,pu	B,pu
1-2	2	-6
1-3	1	-3
2-3	0.666	-1
2-4	1	-3
3-4	2	-6

a) Find Y_{BUS} assuming that the line shown dotted is not connected.
b) What modifications need to be carried out in Y_{BUS}, if the line shown dotted is connected?

Q.4 a) Classify different types of faults in power system. What is the purpose of symmetrical fault analysis? **(05)**

b) What is current limiting reactor? Explain the requirement for selection of current limiting reactor. **(05)**

OR

Q.4 a) Sketch the equivalent circuit of unloaded alternator during subtransient operating state after short circuit. Define subtransient current and impedance. **(05)**

b) A 3-phase 20,000KVA ,22 kV alternator has a subtransient reactance of 8%. A 3-phase short-circuit occurs at its terminals. Determine the fault current and fault MVA. **(05)**

Q.5 Prove that for SLG fault the positive, negative and zero sequence networks are connected in series. **(10)**

OR

Q.5 Prove that for fully transposed transmission line has- **(10)**
a) Equal positive and negative sequence impedances.
b) Zero sequence impedance is much larger than positive sequence impedance.

Q.6 a) Derive swing equation by first principle and also define inertia constant. **(05)**

b) Write short note on: **(05)**
a) Steady state stability
b) Transient stability
c) Dynamic stability

OR

Q.6 Discuss transient stability of one machine infinite bus power system with reference to the following points: **(10)**
Definition, Dynamics of synchronous machine , Equal area criterion

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