B.Tech. SEM -VI Electrical 2014 Course (CBCS) : WINTER - 2018

SUBJECT: POWER SYSTEM ANALYSIS

Day: Wednesday
Date: 14/11/2018

W-2018-2469

Time: 10.00 AM TO 01.00 PM
Max Marks. 60

N.B. :

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

Q.1 a) Explain the need of Power system analysis. What are the permissible variations of voltage and frequency? **(05)**

b) Two voltage sources $V_1 = 130\angle -4^0$ V and $V_2 = 100\angle 0^0$ V are connected by a line of impedance of $Z = (2 + j10)\ \Omega$. Determine real and reactive power loss in the line. **(05)**

OR

Q.1 Write short note on: **(10)**

a) Methods of voltage control

b) Real power-frequency and reactive power-voltage dependency.

Q.2 Derive equivalent π circuit of a long transmission line. Derive constants of this circuit in hyperbolic form. **(10)**

OR

Q.2 a) State the assumptions used to convert the impedance diagram to reactance diagram of power system. **(05)**

b) A 5kVA, 400/200V, 50Hz single phase transformer has primary and secondary leakage reactance each of 2.5Ω.
Determine the total reactance in per unit. **(05)**

Q.3 Show that diagonal element of a Y-bus matrix is equal to the sum of admittances directly connected to that bus and an off diagonal element is equal to the negative sum of admittances directly connected between those buses. **(10)**

OR

Q.3 Figure 3.1 shows the one-line diagram of a simple four-bus system. Table 3.1 gives the line admittances identified by the buses on which these terminate. The shunt admittance at all the buses is assumed to be negligible. **(10)**

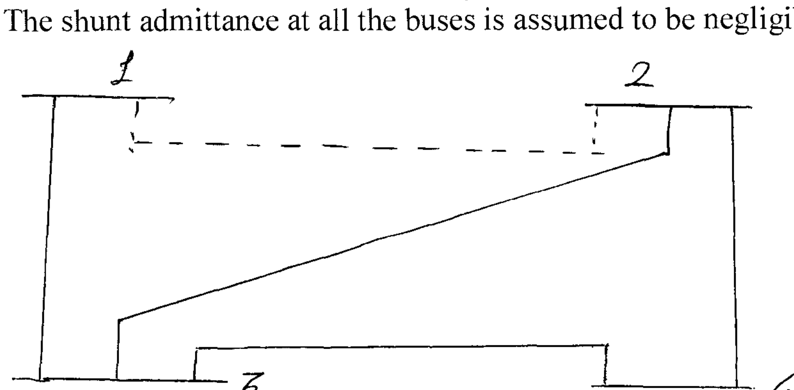

Fig 3.1 One line diagram of four-bus system.

P.T.O.

Table 3.1

Line	G, pu	B, pu
1-2	2.000	- 6.0
1-3	1.000	- 3.0
2-3	0.666	- 2.0
2-4	1.000	- 3.0
3-4	2.000	- 6.0

i) Find Y_{BUS}, assuming that the line shown dotted is not connected.

ii) 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 the current limiting reactor? Explain the aspects to be considered for Selection of **i)** Circuit breaker **ii)** Current limiting reactor **(05)**

OR

Q.4 A 3-phase, 5 MVA, 6.6 kV alternator with a reactance of 8% is connected to a feeder of series impedance (0.12 + j 0.48) ohm/phase/km. The transformer is rated at 3 MVA, 6.6 kV/ 33kV and has a reactance of 5%. **(10)**

Determine the fault current supplied by the generator operating under no load with a voltage of 6.9 kV, when a 3-phase symmetrical fault occurs at a point 15km along the feeder.

Q.5 a) Explain with phasor diagram positive, negative and zero sequence components of unbalanced 3 phase current $\bar{I}_a$, $\bar{I}_b$, $\bar{I}_c$. **(05)**

b) A 10MVA, 13.8 kV alternator has positive, negative and zero sequence reactance's of 30%, 40 % and 5% respectively. **(05)**
What reactance must be put in the generator neutral so that the fault current for a line to ground fault of zero fault impedance will not exceed the rated line current? Express reactance both in per unit and in ohms.

OR

Q.5 a) Sketch the sequence networks of 3 ϕ synchronous alternator. **(05)**

b) For a line-to-ground (L-G) fault, draw the sequence diagram and derive relationship between symmetrical component currents and phase currents. **(05)**

Q.6 a) Derive swing equation of one machine infinite bus system. **(06)**

b) Define steady state stability and transient stability of power system. **(04)**

OR

Q.6 Define stability of power system and derive Equal Area Criteria for deciding stability of one machine-infinite bus system. **(10)**

* * * *