B.TECH. SEM -VI ELECTRICAL 2014 COURSE (CBCS) :
WINTER - 2017
SUBJECT : POWER SYSTEM ANALYSIS

Day : **Tuesday** Time : **10.00 AM TO 01.00 PM**
Date : **21/11/2017** **W-2017-2202** Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.

Q.1 Derive expression for complex power flow over a transmission line and justify P-f and Q-V dependency. **[10]**

OR

a) Two voltage sources $V_1 = 110 \angle -5^0$ V and $V_2 = 100 \angle -0^0$ V are connected by a transmission line whose impedance is $(1 + j7)\ \Omega$. Determine the real and reactive power supplied by or received by each source. **[05]**

b) Derive the equation of real and reactive power. Comment on the parameters that can control real and reactive power flows. **[05]**

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

OR

a) State the assumptions used to convert the impedance diagram to reactance diagram of a power system. **[05]**

b) A 5 KVA, 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 a) Write short note on formation of power-flow equations. **[05]**

b) Classify different types of buses in power system for load flow studies and explain their significance in brief. **[05]**

OR

Explain Newton-Raphson method used to solve the load-flow equations with flow chart. **[10]**

Q.4 a) What is the requirement of selection of circuit breakers? **[05]**

b) Find the value in ohms of the reactance per phase external to a 20 MVA, 10KV, 50 Hz, 3-phase generator such that the steady-state current on short-circuit shall not exceed 8 times the full-load current. The internal reactance of the generator is 5%. **[05]**

P.T.O.

OR

Derive an expression for short circuit current of an unloaded 3ϕ alternator. **[10]**
Sketch : **i)** DC off-set component **ii)** Symmetrical short circuit component.

Q.5 **a)** Sketch the sequence networks of a 3ϕ 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]**

OR

a) List out the different kinds of symmetrical and unsymmetrical faults. **[04]**

b) A 20MVA, 33KV, 3ϕ alternator is subjected to different types of short-circuits and the following are the values of the fault currents: **[06]**
3-phase short circuit = 319 A
Ling – to ground fault = 659 A
Line – to – line fault = 435A
Assuming a generator e.m.f. of 1 per unit and no-load condition before the occurrences of the faults. Determine the positive, negative and zero-sequence reactances of the generator in per unit.

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

Discuss transient stability of one machine infinite bus power system with reference to the following points: **[10]**
Definition, dynamics of synchronous machine, swing equation and its significance.

* * * *