

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V EXAMINATION – WINTER 2015****Subject Code: 150902****Date: 17/12/2015****Subject Name: Power System Analysis and Simulation****Time: 10:30am to 1:00pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q-1

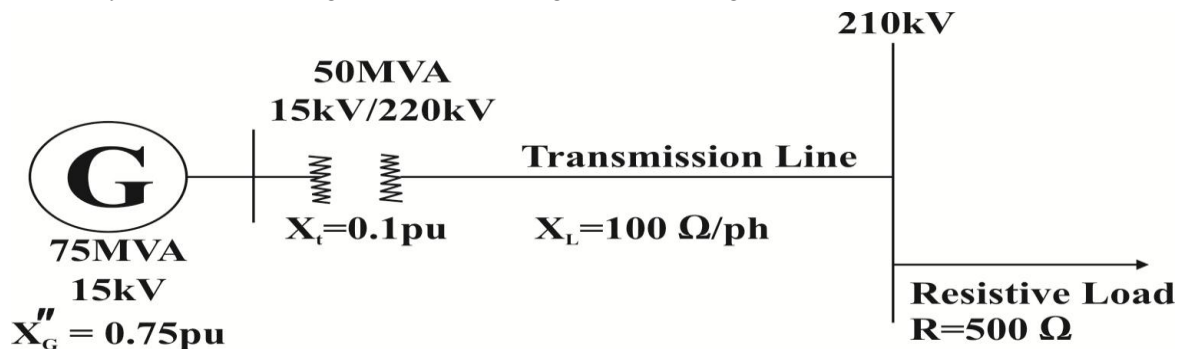
- (a) Derive expressions of voltage phasor and current phasor at any point of a long transmission line as function of distance x from receiving end in terms of distributed parameters of the line, voltage phasor V_R (Voltage at receiving end) and current phasor I_R (current at the receiving end). 07
- (b) A 50 Hz transmission line 300 km long has a total series impedance of $(40 + j 125)$ ohms and a total shunt admittance of 10^{-3} mho. The receiving end load is 50 MW at 220 kV with 0.8 lagging power factor. Find the sending end voltage and current using exact method. 07

Q-2

- (a) Explain sub-transient, transient and steady state reactances of synchronous machine and draw the machine circuit models using them. 07
- (b) State and explain the advantages of pu system used for a power system. 07

OR

- (b) For the system shown in Fig. 1, determine the generator voltage.

**Fig. 1 for Q.2 (b)****Q-3**

- (a) Write a brief note on selection of circuit breakers. 07
- (b) A synchronous generator and a synchronous motor each rated 25 MVA, 11 kV having 15% sub-transient reactance are connected through transformer and a line as shown in Fig. 2. The transformers are rated 25 MVA, 11/66 kV and 66/11 kV with leakage reactance of 10% each. The line has a reactance of 10% on a base of 25 MVA, 66 kV. The motor is drawing 15 MW at 0.8 power factor leading and a terminal voltage of 10.6 kV when a symmetrical three-phase fault occurs at the motor terminals. Find the sub-transient current in the motor, generator and fault. 07

**Fig. 2 for Q.3 (b)**

OR

Q-3

- (a) Explain symmetrical components and state their applications. Derive symmetrical components of a given set of three unbalanced current phasors. 07
- (b) Describe analysis of single line to ground fault at a point of power system using symmetrical components and sequence networks. 07

Q-4

- (a) Discuss factors affecting corona. 07
- (b) Estimate the corona loss for a three conductors each of 10mm diameter and spaced 2.5m apart in an equilateral triangle formation. The temperature of air is 30°C and the atmospheric pressure is 750mm of mercury. Take the irregularity factor as 0.85. Ionization of air may be assumed to take place at a maximum voltage gradient of 30kV/cm. 07

OR

Q-4

- (a) Explain the need of neutral grounding of system. Describe any one method of neutral grounding. 07
- (b) Discuss corona formation phenomenon. 07

Q-5

- (a) Derive expressions of active power and reactive power at the receiving end of a lossless line. 07
- (b) Derive A,B,C and D constants of a medium transmission line for nominal π configuration. 07

OR

Q-5

- (a) Explain travelling waves of a transmission line when the receiving end is short circuited. 07
- (b) Write a note on “Zero Sequence Networks” in brief. 07