Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2015

Subject Code: 150902 **Date: 05/05/ 2015**

Subject Name: Power System Analysis & Simulation

Time: 02.30pm-05.00pm **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)** Deriving the expression of voltage and current of the long transmission line considering the fact that line parameters are distributed uniformly through the line, explain SIL and wavelength of the transmission line. **07**

(b) Power systems are rarely operated with isolated neutral – justify in the light of 'arcing ground'. **07**

Q.2 **(a)** List the advantages of per unit computations. **07**

(b) Discuss various factors and conditions affecting corona loss. **07**

OR

(b) Deriving proper equations explain doubling effect. **07**

Q.3 **(a)** Defining the inductance derive the equation of the inductance of three phase transposed line **07**

(b) Calculate the capacitance to neutral per km of a single phase line composed of single strand conductor of radii 0.328 cm, spaced 3 m apart and 7.5 m above the ground. Consider the effect of earth and recalculate the capacitance. If the line voltage is 220 kV, find the charging current per km of line. **07**

OR

Q.3 **(a)** Derive the equation of the capacitance of a three phase line with equilateral spacing. **07**

(b) Find the inductive reactance in ohms per km at 50 Hz of a three phase bundled conductor line with two conductors per phase as shown in fig.1. All the conductors are ACSR with radii of 1.725 cm. **07**

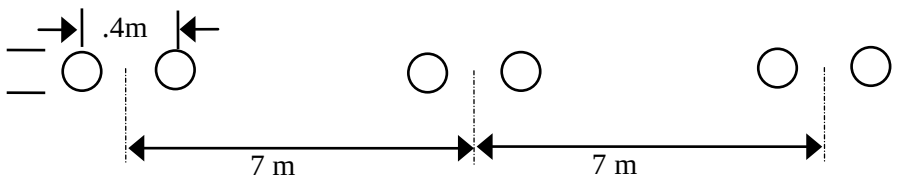

Fig. 1

Q.4 **(a)** Explain 'type 2 modification' of Z_{bus} building algorithm. **07**

(b) A synchronous generator and a synchronous motor each rated 25 MVA, having 15% subtransient reactance are connected through transformers and transmission line as shown in fig. 2. The transformers are rated 25 MVA, 11/66 kV with leakage reactance of 10 % each. The line has a reactance of 10 % on the basis of 25 MVA, 66 kV. The generator is delivering 15 MW at 0.8 power factor lagging and the prefault voltage is 10.6 kV when a symmetrical fault occurs at the middle of the line. Find the subtransient current in the generator, motor and fault with the help of Thevenin's Theorem. **07**

OR

Q.4 **(a)** Explain 'type 3 modification' of Z_{bus} building algorithm. **07**

(b) Explain in detail how fault analysis is helpful in selection of circuit breaker. **07**

Fig. 2

Q.5 **(a)** Prove that positive and negative sequence impedances of fully transposed transmission lines are always equal. **07**

(b) Considering system shown in fig. 2 at no load, find out the line current 'Ia' at fault point when A-G fault occurs at the terminals of the motor. Let zero sequence reactance of generator and motor is 50 % each. Zero sequence reactance of transformers is 25 % each and zero sequence reactance of line is 20 %. 1 ohm each is connected in the neutral circuit of both the synchronous machines. **07**

OR

Q.5 **(a)** Derive the relationship between symmetrical components of line and delta currents. **07**

(b) Considering system shown in fig. 2 at no load, find out the line current 'Ia' at fault point when B-C-G fault occurs at the terminals of the motor. Let zero sequence reactance of generator and motor is 50 % each. Zero sequence reactance of transformers is 25 % each and zero sequence reactance of line is 20 %. 1 ohm each is connected in the neutral circuit of both the synchronous machines. **07**

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