Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2160908 **Date:14/05/2019**

Subject Name:Electrical Power system – II

Time:10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

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

			MARKS
Q.1	**(a)**	Derive ABCD constant for medium transmission line using nominal π representation.	**03**
	(b)	A surge of 120 kv traveling in a line of natural impedance of 600 Ω arrives at a junction with two lines of impedances 900Ω and 300Ω respectively. Find the surge voltages and currents transmitted into each branch line.	**04**
	(c)	Determine the efficiency and regulation of a 3-phase, 120 km, 50Hz transmission line delivering 30MW at 0.866 p.f. lagging,66 KV to a balanced load. The line parameters are as follows: R = 0.1Ω/km/phase, L =1mH/km/phase, C=0.99μF/phase. Use nominal T model of transmission line.	**07**
Q.2	**(a)**	Give classification of faults. What is the difference between steady state reactance Xd, transient reactance Xd' and sub-transient reactance Xd''.	**03**
	(b)	A 3-phase 20 MVA, 11 KV genertor has internal reactance of 7.5% and negligible resistance. Find the external reactance per phase to be connected in series with the alternator so that steady current on short circuit does not exceed 8 times full load current.	**04**
	(c)	Explain factors deciding selection of circuit breaker.	**07**
		OR	
	(c)	Explain the importance of bus impedance matrix in fault calculation.	**07**
Q.3	**(a)**	Why 3-phase symmetrical fault is more severe than 3-phase unsymmetrical fault?	**03**
	(b)	Prove that positive sequence impedance and negative sequence impedance of fully transposed transmission line are always equal.	**04**
	(c)	One conductor of a 3-phase line is open. The current flowing to the delta connected balanced load through the line R is 10A. With R phase as reference and assuming phase B as open, find the symmetrical components of the line currents.	**07**
		OR	
Q.3	**(a)**	What is the reason for transient during short circuit?	**03**
	(b)	What are the symmetrical components and its need?	**04**
	(c)	Three impedances of 5-j10Ω, 6+j5Ω and 3+j15Ω are connected in star to R,Y and B lines of a 3300V, 3-phase, 3-wire supply. The phase sequence is RYB. Calculate the line current I_R.	**07**
Q.4	**(a)**	Differentiate symmetrical and unsymmetrical faults. List various unsymmetrical faults.	**03**
	(b)	Describe analysis of line to line fault at a point of power system using symmetrical components and sequence network. Calculate the value of fault current.	**04**
	(c)	Figure 1 shows a synchronous generator whose neutral is grounded through a reactance Xn. The generator has balanced emfs and sequence reactance X_1, X_2 and X_0 such that $X_1=X_2 > X_0$. i) Draw a sequence	**07**

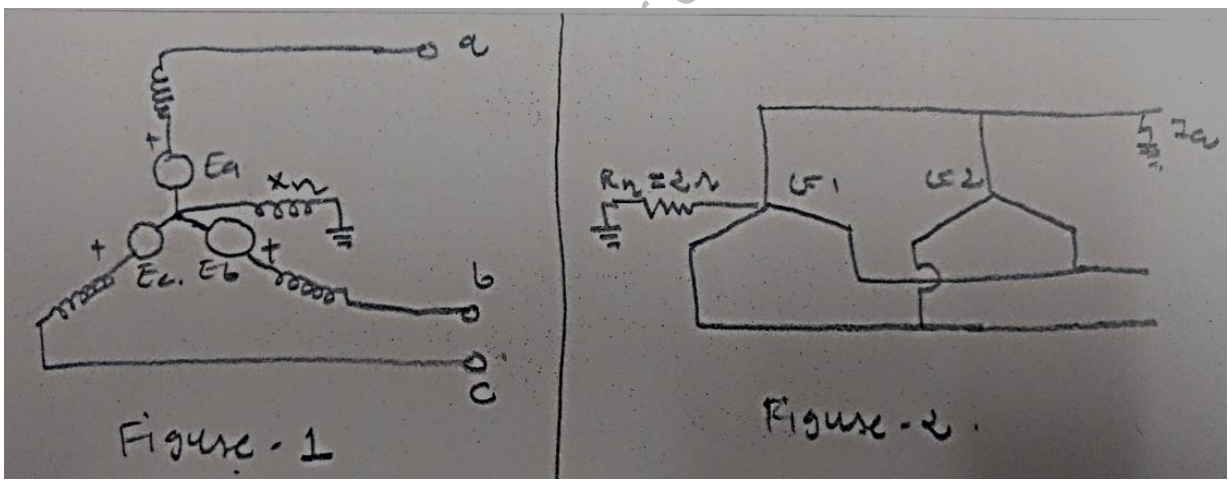
network of the generator as seen from the terminals ii) derive expression for fault current for solid line to ground fault on phase a. iii) prove that if neutral is solidly grounded, the LG fault current is more than three phase fault current.

OR

Q.4	**(a)**	What is the reason for transient during short circuit?	**03**
	(b)	Describe analysis of line to ground fault at a point of power system using symmetrical components and sequence network. Calculate the value of fault current.	**04**
	(c)	Two 11KV, 30 MV, 3-phase star connected generators operates in parallel as shown in figure 2. The positive, negative and zero sequence reactance of each being j0.18, j0.15, j0.1 p.u. The star point of one of the generator is isolated and that of other is grounded through 2Ω resistor. A single line to ground fault occurs at the terminals of one of the generators. Find i) fault current ii) current in grounding resistor iii) voltage across grounding resistor.	**07**
Q.5	**(a)**	Discuss disadvantages of corona. List methods to reduce corona losses.	**03**
	(b)	Explain capacitance switching with necessary waveforms.	**04**
	(c)	Define critical disruptive voltage. Derive necessary formula to calculate critical disruptive voltage.	**07**

OR

Q.5	**(a)**	Determine the critical disruptive voltage and corona loss for a 3-phase line operating at 132 KV which has conductor of 1.25 cm dia arranged ina 3.05 metre delta. Assume air density factor = 1.06 and the dielectric strength of air to be 21KV/cm.	**03**
	(b)	Explain overvoltage due to arcing ground with necessary vector diagram.	**04**
	(c)	List factors affecting corona loss. Discuss any two factors in detail.	**07**



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