Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2020

Subject Code:2160908 **Date:22/01/2021**

Subject Name:Electrical Power system – II

Time:02:00 PM TO 04:00 PM **Total Marks: 56**

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Explain in brief, corona phenomenon in transmission lines.	**03**
	(b)	A 220 kV, 3-Φ transmission line is 50 km long. The resistance is 0.15Ω/km and inductance per phase is 1.33 mH/km. Use short line model to find voltage at the sending end voltage when the line is supplying a load of 400 MVA, 220 kV at 0.8 pf lagging	**04**
	(c)	Using rigorous solution method derive the expression for A,B,C,D constants for long transmission line	**07**
Q.2	**(a)**	What are symmetrical components? Explain how phasor voltages and currents can be expressed in terms of symmetrical components	**03**
	(b)	An overhead line with inductance and capacitance per km of 1.24 mH and 0.087 μF respectively is connected in series with an underground cable having inductance and capacitance per km of 0.185 mH and 0.285 μF. Calculate the values of transmitted and reflected waves of voltage at the junction due to a voltage surge of 110 kV travelling to the junction along the line towards the cable	**04**
	(c)	Discuss the nature of subtransient, transient and steady state current during fault. Under which condition dc component is present in fault current?	**07**
Q.3	**(a)**	The A & B parameters of 3-Φ, 220 kV rated voltage medium length transmission line are given by A = 0.936 + j0.16, B = 33.5 + j138 (Ω/phase). If the load at the receiving end is 50 MW, 220 kV at 0.9 pf lagging, find the magnitude of line to line sending end voltage.	**03**
	(b)	Discuss the criteria for selection of circuit breakers	**04**
	(c)	Two generators rated G1 and G2 are rated 15 MVA, 11 kV and 10 MVA, 11 kV respectively. Two generators are connected to a transformer as shown in figure 1. Calculate the sub-transient current in each generator when a fault occurs on the high voltage side of the transformer.	**07**
Q.4	**(a)**	Prove that symmetrical component transformation is power invariant	**03**
	(b)	The phase voltages of a certain load are given as: Va = 176-j132V, Vb = -128-j96V, Vc = -160 + j100V.	**04**

Calculate positive, negative and zero sequence component of voltage.

(c) Prove that zero sequence impedance of a transmission line is much greater than its positive or negative sequence impedance **07**

Q.5 **(a)** State the difference between symmetrical and unsymmetrical faults giving appropriate examples **03**

(b) Explain how long transmission line can be represented by equivalent T-model. **04**

(c) A 3-bus power system shown in figure 2 experiences a 3-phase solid fault on bus 3. Assuming pre-fault voltage to be $1\angle 0^0$ pu and pre-fault current to be zero calculate the magnitude of fault current. If the values of Z_{13} and Z_{33} are j0.25pu and j0.35pu respectively, find the voltage at bus 1 under fault conditions **07**

Q.6 **(a)** State the difference between disruptive critical voltage and visual critical voltage **03**

(b) Determine the corona loss of a 3-Φ 220 kV, 50 Hz, 200 km long transmission line of three conductors each of radius 1 cm and spaced 5m apart in equilateral triangle formation. The air temperature is 30^0 C and the atmospheric pressure is 760 mm of Hg. The irregularity factor is 0.85 **04**

(c) Discuss factors affecting corona. State the methods to reduce corona **07**

Q.7 **(a)** The following sequence currents were recorded in a power system under fault condition
Ia_1 = -j1.65, Ia_2 = j1.65, Ia_0 = j0.0. Comment on the nature of fault. Justify your answer **03**

(b) Explain how voltage and current waves suffer reflection and refraction when line is short circuited at the receiving end **04**

(c) Derive the expression for attenuation of travelling surge wave on transmission line **07**

Q.8 **(a)** Explain what is restriking voltage after removal of short circuit? **03**

(b) Find the expression for fault current due to LLG fault **04**

(c) A 50 MVA, 11 kV, 3-Φ alternator was subjected to different types of faults. The magnitude of fault currents are as below:
3-Φ fault = 1870 A, L-L fault = 2590A, L-G fault = 4130A. The neutral of the alternator is solidly grounded. Calculate the positive and negative sequence reactance of the alternator **07**

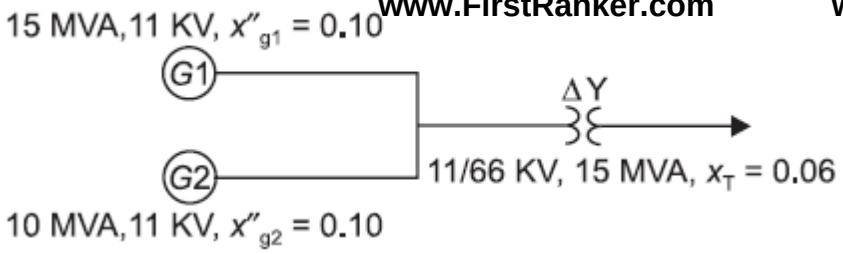

Figure 1

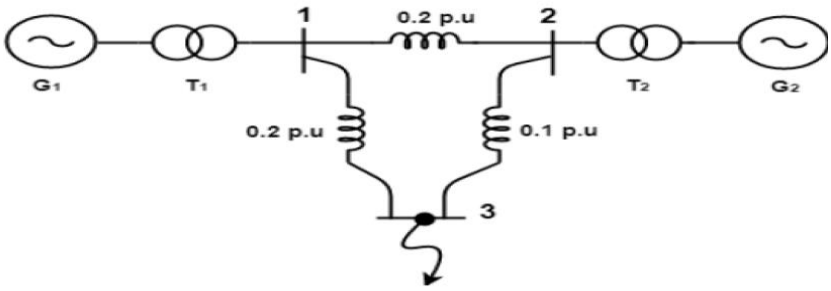

Figure 2

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