Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI EXAMINATION – SUMMER 2020

Subject Code: 2160908 **Date:29/10/2020**

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)**	Discuss the purpose of an overhead transmission line? How are these lines classified?	**03**
	(b)	An overhead 3-phase transmission line delivers 5000 kW at 22 kV at 0.8 p.f. lagging. The resistance and reactance of each conductor is 4 ohm and 6 ohm respectively. Determine: (1) sending end voltage (2) percentage regulation (3) transmission efficiency.	**04**
	(c)	Using Rigorous, Derive expressions for sending end voltage current for long transmission line.	**07**
Q.2	**(a)**	Deriving proper equations explain doubling effect.	**03**
	(b)	Explain sub-transient, transient and steady state reactances of synchronous machine and draw the machine circuit models using them.	**04**
	(c)	A 3-phase transmission line operating at 10 kV and having a resistance of 1 ohm and reactance of 4 ohm is connected to the generating station bus-bar through 5 MVA step-up transformer having a reactance of 5%. The bus bars are supplied by a 10 MVA alternator having 10% reactance. Calculate the short-circuit kVA fed to symmetrical fault between phases if it occurs (i) at the load end of transmission line (ii) at the High voltage terminals of the transformer.	**07**
		OR	
	(c)	Explain the importance of bus impedance matrix in fault calculation. Derive expression for Z_{BUS} at Zb connects an old bus to the reference branch.	**07**
Q.3	**(a)**	Prove that positive and negative sequence impedances of fully transposed transmission lines are always equal.	**03**
	(b)	Explain symmetrical components and state their applications. Derive symmetrical components of a given set of three unbalanced current phasors.	**04**
	(c)	One conductor of a three phase line is open. The current flowing to the Δ Connected load through line "R" is 10 A. with the current in line "R" as reference and assuming that line "B" is open, find the symmetrical components of the line currents.	**07**
		OR	
Q.3	**(a)**	Why is 3-φ symmetrical fault more severe than a 3-φ unsymmetrical fault?	**03**
	(b)	Derive A,B,C and D constants of a medium transmission line for nominal π configuration.	**04**

	(c)	Write a brief note on selection of circuit breakers.	**07**
Q.4	**(a)**	What is a 3-phase unsymmetrical fault? Discuss the different types of unsymmetrical faults that occur on a system.	**03**
	(b)	Explain single line to ground fault on an unloaded generator using symmetrical components. Draw connection of sequence networks.	**04**
	(c)	Draw a general circuit which can be used to determine zero sequence network of a two-winding transformer. Using this circuit, draw the zero sequence networks for (i) delta-star transformer with star point grounded. (ii) delta-delta transformer. (iii) star-star transformer with star point grounded.	**07**

OR

Q.4	**(a)**	Explain restriking voltage after the removal of short circuit.	**03**
	(b)	Derive an expression for the fault current for a double-line fault as an unloaded generator.	**04**
	(c)	A 3-phase, 3-wire system has a normal voltage of 10.4 kV between the lines. It is supplied a generator having positive, negative and zero sequence reactances of 0.6, 0.5 and 0.2 Ω per phase respectively. Calculate the fault current which flows when a line-to-line fault occurs at the generator terminals.	**07**
Q.5	**(a)**	Discuss various factors and conditions affecting corona loss.	**03**
	(b)	Give Reason that the disruptive critical voltage is less than visual critical voltage.	**04**
	(c)	A 3-phase, 220 kV, 50 Hz transmission line consists of 1.5 cm radius conductor spaced 2 meters apart in equilateral triangular formation. If the temperature is 40^0C and atmospheric pressure is 76 cm, calculate the corona loss per km of the line. Take $m_0 = 0.85$.	**07**

OR

Q.5	**(a)**	Write a short note on capacitance switching.	**03**
	(b)	Explain travelling waves of transmission line when receiving end is short circuited briefly.	**04**
	(c)	Power systems are rarely operated with isolated neutral – justify in the light of 'arcing ground'.	**07**

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