Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2160908 Date:01/05/2018

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)**	Define voltage regulation of a transmission line. List out methods for line compensation based on value of voltage regulation.	**03**
	(b)	What is receiving end power circle diagram? Write down steps to draw it.	**04**
	(c)	A 200 km long three phase overhead line has a resistance of 48.7 ohms per phase, inductive reactance of 80.2 ohms per phase and capacitance (line to neutral) 8.42 nF per km. It supplies a load of 13.5 MW at a voltage of 88 kV at 0.9 lagging power factor. Using nominal T circuit, find sending end voltage, sending end current, voltage regulation and power angle of given line.	**07**
Q.2	**(a)**	Give classification of faults. What is difference between steady state reactance X_d, transient reactance X_d' and sub-transient reactance X_d''?	**03**
	(b)	Three 20 MVA generators each having a reactance of 0.2 pu are operating in parallel. A fault occurs at generator bus. Find the fault MVA if fault is symmetrical.	**04**
	(c)	What is circuit breaker? How is its rating decided?	**07**
		OR	
	(c)	A three phase 20 MVA, 10 kV alternator has an internal reactance of 5 % and negligible resistance. Find the external reactance to be connected in series with each phase so that steady state current in each phase does not exceed 8 times full load current.	**07**
Q.3	**(a)**	What are symmetrical components and its need?	**03**
	(b)	Show that symmetrical component transformation is power invariant.	**04**
	(c)	The line to neutral voltages in a three phase system are V_{an} = 200 + j0 V, V_{bn} = - 43.4 – j 246.2 V and V_{cn} = - 52.1 + j295.4 V. Find V_{a1}, V_{a2} and V_{a0}. Form these values, find values of V_{b1}, V_{b2}, V_{b0}, V_{c1}, V_{c2} and V_{c0}.	**07**
		OR	
Q.3	**(a)**	Why does a generator produce only positive sequence voltage?	**03**
	(b)	Write equation of phase voltage in terms of symmetrical components.	**04**
	(c)	Discuss the significance of zero sequence circuit. Why should Z_n appear as $3Z_n$ in zero sequence equivalent circuit?	**07**
Q.4	**(a)**	How does neutral grounding affect the fault calculation?	**03**
	(b)	A 30 MVA, 11 kV generator has $Z_1 = Z_2$ = j0.2 pu, Z_0 = j0.05 pu. A line to ground fault occurs on the generator terminals. Find the fault current. Assume that the generator neutral is solidly grounded and	**04**

that the generator is operating at no load condition and at rated voltage at the occurrence of fault.

(c) Using appropriate interconnection of sequence networks, derive the equation for a line to line fault in a power system with fault impedance of Z_f. **07**

OR

Q.4 **(a)** Which sequence current flows through ground and ground wires and why? **03**

(b) Give reason: for a fault at alternator terminals, a single line to ground fault is generally more severe than a three phase fault. **04**

(c) A three phase, 37.5 MVA, 33 kV alternator having $X_1 = 0.18$ pu, $X_2 = 0.12$ pu and $X_0 = 0.10$ pu, based on its ratings, is connected to a 33 kV overhead line having $X_1 = 6.3$ ohms, $X_2 = 6.3$ ohms and $X_0 = 12.6$ ohms per phase. A single line to ground fault occurs at the remote end of the line. The alternator neutral is solidly grounded. Calculate fault current. **07**

Q.5 **(a)** Write a brief note on capacitance switching. **03**

(b) A surge of 15 kV magnitude travels along a cable towards its junction with an overhead line. The inductance and capacitance of the cable and overhead line are respectively 0.3 mH, 0.4 μF and 1.5 mH, 0.012 μF per km. Find the voltage rise at the junction due to the surge. **04**

(c) Derive the equation for attenuation of travelling waves. **07**

OR

Q.5 **(a)** Explain the phenomena of corona. **03**

(b) Give reasons for following: The disruptive critical voltage is less than visual critical voltage. **04**

(c) Find the critical disruptive voltage and the critical voltages for local and general corona on a three phase overhead transmission line, consisting of three stranded copper conductors spaced 2.5 m apart at the corners of an equilateral triangle. Air temperature and pressure are 21 ˚C and 73.6 cm Hg respectively. The conductor diameter, irregularity factor and surface factor are 10.4 mm, 0.85, 0.7 and 0.8 respectively. **07**

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