GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:2160908   **Date:14-12-2022**

Subject Name:Electrical Power system – II

Time:02:30 PM TO 05:00 PM   **Total Marks:70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	How transmission lines are classified? Discuss the terms voltage regulation and transmission efficiency for transmission line.	**03**
	(b)	Derive ABCD constant for medium transmission line using nominal *T* representation	**04**
	(c)	Find the following for a single circuit transmission line delivering a load of 50 M VA at 110 kV and p.f. 0·8 lagging: (i) sending end voltage (ii) sending end current (iii) sending end power (iv) efficiency of transmission. Given A = D = 0·98 ∠3º; B = 110 ∠75º ohm; C = 0·0005 ∠80º siemen.	**07**
Q.2	**(a)**	How the faults on a power system are classified? What is the difference between steady state reactance X_d, transient reactance X_d' and sub-transient reactance X_d''.	**03**
	(b)	A 3-phase alternator can supply a maximum load of 5000 kVA at 6600 V. The machine has internal reactance of 6%. Find the reactance per phase of the limiting reactor if the steady apparent power (kVA) on short-circuit is not be exceed 5 times the full-load value.	**04**
	(c)	Write note on Selection of a circuit breaker.	**07**
		OR	
	(c)	Explain the importance of bus impedance matrix in fault calculation.	**07**
Q.3	**(a)**	What is operator 'a'? Show that: (i) $a^2 = -0·5 - j\,0·866$ (ii) $a^3 = 1$ (iii) $1 + a + a^2 = 0$	**03**
	(b)	Prove that positive sequence impedance and negative sequence impedance of fully transposed transmission line are always equal.	**04**
	(c)	In a 3-phase, 4-wire system, the currents in R, Y and B lines under abnormal conditions of loading are as under: $I_R = 100 ∠30º$ A; $I_Y = 50 ∠300º$ A; $I_B = 30 ∠180º$ A. Calculate the positive, negative and zero sequence currents in the R-line and return current in the neutral wire.	**07**
		OR	
Q.3	**(a)**	What do you understand by positive, negative and zero sequence impedances?	**03**
	(b)	Show that for a fully transposed line, the zero-sequence impedance is much higher than positive or negative sequence impedance.	**04**
	(c)	The sequence voltages in the red phase are as under: $E_{R0} = 100$ V; $E_{R1} = (200 - j\,100)$ V; $E_{R2} = -100$ V. Find the phase voltages $E_R,\ E_Y$ and E_B.	**07**

Q.4 **(a)** Why is 3-φ symmetrical fault more severe than a 3-φ unsymmetrical fault? **03**

(b) Which sequence current flows through ground and ground wires and why? **04**

(c) Describe analysis of line to ground fault at a point of power system using symmetrical components and sequence network. **07**

OR

Q.4 **(a)** What is 3 phase unsymmetrical fault? Discuss the different types of unsymmetrical in brief. **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 50 MVA, 11 kV three-phase alternator was subjected to different types of faults. The fault currents are as under: **07**

3-phase fault = 2000 A;

Line-to-Line fault = 2600 A;

Line-to-ground fault = 4200 A.

The generator neutral is solidly grounded. Find the values of the three sequence reactances of the alternator. Ignore resistances.

Q.5 **(a)** A 3-phase line has conductors 2 cm in diameter spaced equilaterally 1 m apart. If the dielectric strength of air is 30 kV (max) per cm, find the disruptive critical voltage for the line. Take air density factor $\delta = 0\cdot952$ and irregularity factor $m_o = 0\cdot9$. **03**

(b) Explain the following terms with reference to corona: **04**
   (i)   Critical disruptive voltage
   (ii) Visual critical voltage

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

OR

Q.5 **(a)** What is corona? What are the factors which affect corona? **03**

(b) Discuss the advantages and disadvantages of corona. **04**

(c) Explain travelling waves of transmission line when receiving end is short circuited briefly **07**

****