Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2022

Subject Code:3150911 Date:11-01-2023

Subject Name: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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Differentiate between Short, medium and long transmission lines and state how the method of analysis differs in each type.	**03**
	(b)	Three loads are connected in parallel across a 1400 V rms, 60 Hz, single phase a.c. supply. Load-1: Inductive load, 125 kVA at 0.28 power factor Load-2: Capacitive load, 10 kW and 40 kvar Load-3: Resisitive load of 15 kW Find the total active, reactive and apparent power drawn from the supply and the overall power factor as viewed from the supply side.	**04**
	(c)	Write a short note on per unit representation of transformers.	**07**
Q.2	**(a)**	What is the reason behind occurrence of Ferranti Effect? How Ferranti effect can be prevented?	**03**
	(b)	Draw phasor diagram for a short transmission line when operating at (i) lagging power factor load (ii) leading power factor load Is it possible to have zero voltage regulation when operating at some load? Explain.	**04**
	(c)	Explain Nominal-T and Nominal-π methods for analysis of medium transmission lines.	**07**
		OR	
	(c)	Briefly discuss various methods of voltage control in power systems.	**07**
Q.3	**(a)**	Explain how the Breaking Capacity of a circuit breaker can be calculated. Also explain how Fault MVA can be calculated.	**03**
	(b)	Two synchronous generators in a power plant are connected to a common bus bar. The generator ratings are as follows. Generator-1: 10 MVA, 11 kV, $X_d^{"}$ =40 % Generator-2: 15 MVA, 11 kV, $X_d^{"}$ =60 %	**04**

Determine fault current when a three phase fault takes place at the bus bar while the generators were operating at no load.

(c) Discuss: Transients on a transmission line during a short circuit. **07**

OR

Q.3 **(a)** Explain any one type of modification in Bus Impedance Matrix due to addition of a branch or link in the network. **03**

(b) A three bus power system has its Z_{BUS} matrix given as, **04**

$$Z_{BUS} = \begin{bmatrix} j0.25 & j0.1 & j0.15 \\ j0.1 & j0.25 & j0.1 \\ j0.15 & j0.1 & j0.15 \end{bmatrix} \text{ p.u.}$$

A three phase fault occurs at bus-2 of the system.
Assuming all pre-fault voltages to be 1.0 p. u., determine,

(i) Fault current when a 3-phase fault occurs at bus-2
(ii) Voltage at bus-3 when the fault occurs on bus-2

(c) A synchronous generator rated 500 kVA, 440 V with a sub-transient reactance of 0.25 p.u. is supplying a static load of 400 kW at 0.8 p.f. lagging at rated terminal voltage. A three phase fault occurs at the generator terminals. Determine: **07**

(i) e.m.f. behind transient reactance
(ii) symmetrical short circuit current during sub-transient stage

Q.4 **(a)** If α is a complex operator such that $\alpha = e^{j120^\circ}$, then evaluate the following terms: **03**

(i) $\alpha^2 - 1$
(ii) $1 - \alpha - \alpha^2$

(b) Explain Symmetrical Component Transformation **04**

(c) Explain analysis of a line to ground fault. **07**

OR

Q.4 **(a)** Draw zero sequence networks of three phase transformers with the following connections. **03**

(i) $\Delta - Y$ connection with star side neutral isolated
(ii) $Y - Y$ connection with any one side neutral solidly grounded

(b) Explain analysis of a line to line fault. **04**

(c) A three phase synchronous generator rated 11 kV, 50 MVA has positive, negative and zero sequence reactances as 0.2 p.u., 0.1 p.u. and 0.05 p.u. respectively with machine ratings as base values. The generator is star connected with the neutral point solidly grounded. Find the magnitude of fault current in the event of a: **07**

(i) Three phase fault
(ii) Line to ground fault

at generator terminals. Assume generator at no load prior to fault.

Q.5 **(a)** Describe methods to reduce corona loss. **03**

(b) Discuss switching transients in an R-L circuit(power system) supplied by an a.c. source. **04**

	(c)	Explain the concept of Travelling Waves.	**07**
		OR	
Q.5	**(a)**	Describe the factors affecting corona loss.	**03**
	(b)	Explain the working of Thyrite valve type surge arresters for protection against overvoltages.	**04**
	(c)	Explain reflection of a travelling wave in a line terminated by: (i) open circuit. (ii) short circuit	**07**

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