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

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 170903 **Date: 04/05/2017**

Subject Name: Power System Protection

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.**

Q.1	**(a)**	Derive an expression for torque produced by an induction relay. Using the expression find the necessary conditions for two alternating fluxes acting on a rotor to produce Torque and max Torque.	**07**
	(b)	Suggest type of protective relay for i) Induction disc type construction ii) Induction cup type construction & How the over run of the disc is minimized?	**07**
Q.2	**(a)**	Describe the techniques used to realize various time – current characteristics using electromagnetic relays.	**07**
	(b)	What is the difference between plug setting and pick-up value of an Over Current relay? Define Under reach, TMS, and through fault.	**07**
		OR	
	(b)	Discuss essential qualities of a protective relay.	**07**
Q.3	**(a)**	Discuss the operating principle and applications of directional relay.	**07**
	(b)	Explain how the percentage differential relay overcomes the draw backs of the simple differential relay.	**07**
		OR	
Q.3	**(a)**	What is the effect of fault resistance on the reach of various distance relays and which relay is the most affected and which the least affected?	**07**
	(b)	Why does an IDMT relay offer an inverse time-current characteristic for low values of the fault current and a definite time- current characteristic for high values of the fault current? A 3-phase 33 / 6.6 KV Star/Delta connected transformer is protected by differential protection. The C.T. on LT side have a ratio of 300/5.Find the C.T. ratio on HT side?	**07**
Q.4	**(a)**	Explain harmonic restraint by neat diagram?	**07**
	(b)	Draw and explain the circuit connection of three impedance relays together with directional relay, circuit breaker trip coil, CB auxiliary switch, seal-in relay and flags.	**07**
		OR	
Q.4	**(a)**	Explain the basic difference between a C.T. used for instrumentation and a C.T. used for protection? What is meant by burden of a C.T.? Calculate the VA output required for a CT of 5A rated secondary current when a burden consists of relay requiring 10VA at 5A plus loop lead resistance 0.2 Ohm.	**07**

	(b)	Explain carrier based Phase comparison scheme?	**07**
Q.5	**(a)**	What are various abnormal operating conditions from the load side and supply side to which an induction motor is subjected to?	**07**
	(b)	Draw the schematic block diagram of a numerical relay and explain each of its components.	**07**

OR

Q.5	**(a)**	Discuss the protection employed against loss of excitation of an alternator?	**07**
	(b)	Why does a bus bar differential scheme have a tendency to operate for external fault?	**07**

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