EE Department, UET, Lahore
Faisalabad Campus

Reg. No. _____

EE454 Power System Protection
Final Exam (2 Jan. 2023, Session 2019)

Time Allowed: 90 Minutes
Total Marks: 40

➢ Start solution of every new question on a new page.
➢ All the related parts of a question must be solved together.

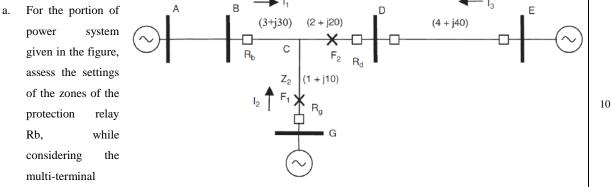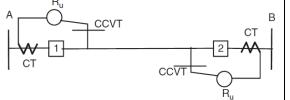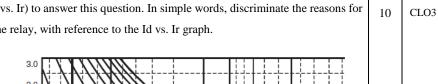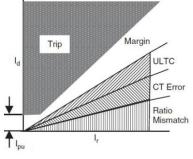|				
Q.1	a.	For the portion of power system given in the figure, assess the settings of the zones of the protection relay Rb, while considering the multi-terminal power structure of the system. Various impedances are shown on the lines, assume the n_i/n_e factor to be equal to unity for simplicity, and assume that the I_2/I_1 factor is equal to 0.3. The zone settings are given as follows: Rb – zone 1 = 5.1 + 60j ohms, Rb – zone 2 = 5.5 + 55j ohms, Rb – zone 3 = 8 + 80j ohms	10	CLO2
	b.	For the distance protection of a three phase line, what is the voltage and current to be provided to the relay for correct determination of fault impedance, in case of ground faults.	3	
	c.	What will be the change in the answer of part 'b', if there are two three phase lines running in parallel.	3	

	d.	For the power system portion as shown here, sketch RX plane diagrams showing zones of protection of pilot distance relays at bus A and bus B, assuming mho relays and that the scheme of protection is
		
		    i. Direct Under-reach transfer trip
		    ii. Permissive Over-reach transfer trip
			4	

Q.2	a.	Analyze the procedure of choosing the slope of a percentage differential relay for the protection of a transformer. You may refer to the accompanying graph (Id vs. Ir) to answer this question. In simple words, discriminate the reasons for choosing a certain value of the slope of the relay, with reference to the Id vs. Ir graph.	10	CLO3
	b.	Consider a 1000hp induction motor, with full load current of 200 A. An inverse time over-current relay has been used for its protection, via a 300:5 CT. The relay is set up so that the pick-up current is 5A while the TDS is 1. The motor takes 0.5 seconds to start. Analyze this system to find the maximum locked rotor current which the motor can draw at start-up, without causing the relay to trip.	10	