Report Submission Guidelines: **Handwritten**

1. Plot the percentage biased differential characteristics for the two data sets provided in two graph sheets. (Write your roll number and name at the top of the sheets)
2. Plot the reference characteristic for the mentioned setting for each graph plotted.
3. Write on your assessment for each experimental data set compared to reference graph.
4. Write your suggestions how the performance of the relay can be improved further.
5. A transformer differential relay observes the presence of 2nd, 3rd, 4th and 5th harmonic components as (9%, 0.02%, 4% and 41%) respectively of the fundamental component in the differential current. Such a situation indicates which of the following situation?

   a) High loading b) Inrush c) Overexcitation d) CT saturation

6. For the three data sets provided in the table write the fault situation (internal/ external) in the column provided with justification.

Transformer rating: 37.5 MVA, 220 kV/11 kV. **Relay setting**: I_{pu} = 0.2, m_1 = 0.5, and m2 = 0.9

	I_1 (A)	I_2 (A)	Fault (internal/ external)	Justification
Case 1	$76.84\angle -17.92°$	$420.02\angle 145.5°$		
Case 2	$48.30\angle -20.66°$	$955.78\angle 160.1°$		
Case 3	$49.51\angle -17.99°$	$426.12\angle 148.5°$		

6. A Simulink model is attached where a 37.5 MVA, 220 kV/ 11 kV transformer is protected by percentage bias differential protection. Create phase-A-to-ground faults at F1, F2 and F3 with a fault resistance of (last digit of roll number) Ω. Write your analysis for the fault situations.

(Note: Those who have '0' as the last digit of roll number should take the fault resistance as 0.01 Ω)

Fault Resistance	Current (in Per Unit)	F_1	F_2	F_3
R_f (in Ω)	I_1			
	I_2			
	$I_{operating}$			
	$I_{restraining}$			
	Remarks			