Bachelor of Electrical Engineering Supplementary Examination, 2017

(4th Year, *1st* Semester) .

Power System Protection and Switchgear

Time: Three Hours

Full Marks: 100

(50 marks for each part)

Use a separate Answer-Script for each Part

PART-I.

Answer *any three* questions from this part.

Two marks are reserved for neat and well organised answer

1.	a)	Explain what you understand by unsymmetrical faults in a power system network. State the assumptions considered for the analysis of faults in power systems.	8
	b)	In a balanced three phase system the negative sequence voltage and current are zero – Explain.	4
	c)	A 30 MVA, 11kV generator has $Z_1 = Z_2 = j0.2$ pu, $Z_0 = j0.05$ pu. A line to line fault occurs on the terminals of the generator. Find the line currents under fault condition.	4
2.	a)	Derive the necessary equation to determine the fault current for a single line to ground fault with diagram showing the interconnection of sequence networks.	8
	b)	A 50MVA, 11kV three phase synchronous generator was subjected to different types of faults. The fault currents are as follows: LG fault - 4200A, LL fault – 2600A, LLL fault – 2000A. The generator neutral is solidly grounded. Find the per unit values of the sequence reactances of the generator.	8
3.	a)	Derive the expression of power in terms of symmetrical components.	4
	b)	Line currents flowing to delta connected load does not contain zero sequence currents – Explain	4
	c)	Derive the expression for restriking voltage in a circuit breaker.	8

4.	a)	Explain how arc is initiated and sustained in a circuit breaker when circuit breaker contacts separate.	8
	b)	Describe the methods of arc extinction in a circuit breaker.	8
5.		Write short note on any four: a) Minimum oil circuit breaker b) Axial air blast circuit breaker c) Cross air blast circuit breaker d) Self compensated explosion pot oil circuit breaker e) Zero sequence impedance of transformer	4x4

<u>BACHELOR OF ELECTRICAL ENGINEERING (SUPPLEMENTARY) EXAMINATION, 2017</u>
(4th year, 1st Semester)

SUBJECT: - POWER SYSTEM PROTECTION AND SWITCHGEAR

Full Marks: 100

Time: Three hours   (50 marks for this part)

Use a separate Answer-Script for each part

No. of Questions		PART -II Answer any Three (Two marks reserved for well organized answers)	Marks
1)	a)	Explain "pick up" and "drop out" current in connection to an overcurrent relay. Explain why sensitivity is better maintained for a.c attraction type overcurrent relay over its d.c counterpart. What are the disadvantages of a.c and d.c attraction type overcurrent relays?	(2+4+4)
	b)	Why the power system is divided into different protective zones?	(6)
2)	a)	Explain how the pick up current and time delay are obtained while selecting the settings of an I.D.M.T.L relay.	(8)
	b)	With the help of a neat diagram explain how directional overcurrent relays protects ring main feeders. Discuss briefly about the construction of directional type overcurrent relay.	(5+3)
3).	a)	Why the plug settings for an earth fault relay vary between 10 % to around 70 %? What are the advantages of using earth fault relays over overcurrent relays for detection of phase to ground faults?	(4+4)
	b)	State the universal torque equation for distance relays. Realize an ohm relay and reactance relay from this universal torque equation with help of four-pole induction cup unit.	(8)
4)	a)	What is power swing in a power system network and explain how it effects the operation of impedance and mho relays.	(4+4)
	b)	With necessary connection diagram and derivation explain how the c.t.s on the two sides of a star-delta transformer should be connected to avoid spurious tripping. Also explain why harmonic restraint feature is necessary for transformer differential relays.	(6+2)
5)		Write short notes from any two of the following: i) Protection required for large induction motors. ii) Negative sequence relaying scheme for alternators. iii) Buchholz relay for transformer protection. iv) Carrier acceleration scheme and Carrier inter-tripping scheme.	(8 ×2)