Transformer & Alternators

Subject Code – EEE201

Lecture (Knowledge Criteria)	
1	1. Magnetic circuit, MMF, reluctance and mention their units, Absolute permeability and Relativepermeability and mention their units, relationship between Flux, MMF and Reluctance. simple problems on magnetic circuit
	2. **AC fundamentals** Concept of capacitive reactance, inductive reactance, and impedance. Current and Power in a pure resistive, inductive and capacitive circuit.
	3. Current, Power and Power factor of R-L, R-C, R-L-C series and parallel circuits. Concept andApplications of resonance.
2	**TRANSFORMERS** 1. Basics: a. Working Principle of Transformer. b. Construction. c. Operation.
	2. **Classification of Transformers**: a. Based on Construction b. Based on No. of phases c. Based on application **Shell and Core type**: Construction and application.
	3. **Main Parts of Transformer**: a. Tank b. Core c. Winding d. **Insulation:** i. Oil ii. Paper e. Bushings (HT/LT/NT) f. Conservator g. OLTC (ON Load/OFF Load Tap Changers) h. Breather i. **Safety Devices**: i. Pressure Relief Device ii. Buchholz Relay j. **Instruments**: i. Oil Temperature Indicator (OTI)/Transmitter ii. Winding Temperature Indicator (WTI)/Transmitter iii. Conservator Oil level Indicator/Transmitter
3	1. Derive emf equation, and explain transformation ratio (K).Explain Operation of a transformer on No-load with a vector diagram.
	2. Operation of a transformer On-load with vector diagrams.Draw equivalent Circuit of transformer.

	3. Problems on emf equation, transformer on NO-load and ON-loadconditions.
4	1. **Losses in Transformer** -List Various losses in a transformer. - Voltage regulation and efficiency in thetransformer. - Write an equation for voltageregulation and efficiency. -Condition for maximum efficiency. - All day efficiency. -Problem on all-day efficiency.
	2. Pre-determine the Regulation andEfficiency of 1-ph transformer by conducting O.C. and S.C. tests.
	3.Necessity and conditions for paralleloperation. - Parallel operation of single phase transformers with their loadsharing.
5	1.Generation of 3-ph voltage, phase sequence, Star and Delta Connection in 3-ph system, Relation between line voltage and phase voltagein 3-ph Star, Relation between line voltage and phase voltage in 3-ph Deltasystem. Equation for a 3-ph power
	2. Working principle & construction ofthree-phase transformers. Connection type: i. Star-Delta ii. Delta-Star iii. star-star iv. Delta-Delta v. Open delta vi. Scott.
	3. Vector Group i. Brief introduction of Vector Grouping ii. Type of Vector group: a. Yy0, Dd0 b. Yd1, Dy1 c. Yd6, Dy6 d. Yd11, Dy11. Problems on 3 phase star and deltacircuits.
6	1. **Special purpose transformers** Construction and working of currenttransformer (CT). **Ref.7.2(9)**

	2. Construction, working of potential transformer (PT)
	3.Construction, working of Pulse, Toroidal, Isolation transformer andAuto transformer
7	1. Study Code of practice for selection, installation and maintenance of transformers. **IS 10028**
	2. Study IS 1180 and IS 2026 standards: a. scope of IS 1180 and IS 2026 b. List transformers covered and not covered by IS 1180 c. List manufacturer of IS 1180 transformers.
	3. **IEC 60071-1 to IEC 60071-12** standards for power transformers
8	1.Testing and Troubleshooting of giventransformer-1
	2.Testing and Troubleshooting of given transformer -2
	3. Installation and Commissioning of transformer
9	1a. Working principle and construction of DC generator. 1b**. Alternator:** working principle, Construction of salient pole and non-salient pole alternator.
	2.Full pitch Armature windings and Fractional pitch Armature windings. Advantages and dis-advantages of Full pitch and Fractional pitch Armature windings.
	3. Relationship between P,N,f and Derivation of emf equation, Simple problems on E.M.Fequation.
10	1. Armature reaction in an alternator with sketches, Effects of p.f of load on armature reaction and Effects of

	armature reaction on terminal voltage.
	2. Procedure for conducting O.C & S.C.tests on an alternator with circuit arrangements.
	3. Effective resistance, leakage reactance & synchronous reactance. Calculate the synchronous impedanceby O.C. & S.C test results. Equation for the no-load terminal voltage at different power factors. Voltage regulation definition and methods.
11	1. Vector diagram of alternator on Loadat different power factors.
	2. Necessity and Conditions for paralleloperation of three-phase alternators.
	3. Parallel operation of three-phasealternators using synchroscope.
12	1. Meaning and types of excitations.Static excitation system **Ref.7(14)**
	2. Effect of unequal voltage on load sharing. Effect of change in excitationand prime mover input power on distribution of load.
	3. Hunting and its prevention in alternators. Necessity of cooling in alternators. Cooling agents. – Hydrogen cooling.
13	1. Maintenance of the transformer.
	2. Installation and Maintenance ofalternator. **Ref.7(15)**
	3. Construction of an Energy efficienttransformer. -Star rating of a transformer. -Benefits Of Higher Efficiency inTransformers. -Calculate Cost saving by buying an energy efficient transformer.

Reference:

Sl. No.	Description
1	Electrical Technology volume 2 - BL Theraja & A.K.Theraja S.Chand publication
2	Principles of Electrical Machines by V.K.Mehtha.S.Chand publication
3	Electrical Machines by M.N. Bandyopadhyay PHI Learning Pvt. Ltd.
4	Electrical Machines by Bhattacharya. Tata McGraw Hill Co.
5	Electrical Machines - J.B.Guptha Kataria & Sons Publications
6	Generation of Electrical Energy by BR Gupta. S.Chand Publication.
7	Fundamentals of electrical drives - G.K. Dubey Narosa publications.
8	Electrical Machines – Deshpande.
9	http://www.anuraghyd.ac.in/eee/wp-content/uploads/sites/3/power-systems.pdf
10	https://www.youtube.com/watch?v=FQ22UM0zyGs&feature=emb_logo
11	https://www.youtube.com/watch?v=mjLs40e_9YE&feature=emb_logo
12	https://relaytraining.com/wp-content/uploads/2013/07/PT-Testing Back-to-the-Basics_RelayTraining.com_.pdf
13	https://electrical-engineering-portal.com/testing-commissioning-current-transformer
14	https://www.youtube.com/watch?v=34Fj7O_sU9I
15	https://search.abb.com/library/Download.aspx?DocumentID=SM103&LanguageCode=en&DocumentPartId=&Action=Launch
16	https://www.stamford-avk.com/sites/stamfordavk/files/AGN007_C.pdf