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Electrical Circuits-II

Course Objectives:
- To know the analysis of three phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits.
- To analyze the networks using different two port parameters
- Knowing how to determine the transient response of R-L, R-C, R-L-C circuits for D.C and A.C excitations
- To know the applications of Fourier series to electrical circuits excited by nonsinusoidal Sources
- Study of Different types of filters.

Unit - I: Three Phase A.C. Circuits

Introduction - Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Analysis of Three Phase Unbalanced Circuits - Loop Method - Star Delta Transformation Technique – for balanced and unbalanced circuits – Advantages of Three Phase System – Numerical problems

Learning outcomes:
- Learn about different three phase circuit types
- Learn about different analysis to solve three phase circuits

Unit - II: Two Port Networks

Two Port Network Parameters – Impedance – Admittance - Transmission and Hybrid Parameters and their Relations – Interconnection of two port networks – Numerical analysis - Concept of Transformed Network - Two Port Network Parameters Using Transformed Variables
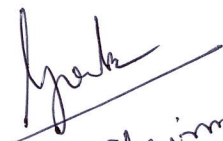
Learning outcomes:
- Understand and estimate the network parameters of DC circuits
- Understand how Laplace transforms can be applied to energy storage elements in electrical circuits

Unit - III: DC Transients

Transient Response of series and parallel combinations of R-L, R-C, R-L-C Circuits for D.C Excitation - Initial Conditions – Final conditions - Solution Methods Using Differential Equation and Laplace Transforms - Numerical analysis

Learning outcomes:
- Understand the transient analysis of DC circuits
- Distinguish between different solution methods for DC circuits

(BOS-Chairman)

Unit - IV: AC Transients

Response of R-L & R-C Networks to Pulse Excitation – Transient Response of series and parallel combinations of R-L, R-C, R-L-C Circuits for Sinusoidal Excitations - Solution Method Using Differential Equations and Laplace Transforms – Numerical analysis

Learning outcomes:
- Understand the transient analysis of AC circuits
- Distinguish between different solution methods for AC circuits

Unit - V: Applications of Fourier series and Filters

Applications of Fourier series to series RL, RC and RLC circuits under steady state conditions - Passive filters – Low Pass – High Pass - Band Pass – Band elimination – T and π section filters – Analysis of constant k, m-derived and composite filters – Numerical analysis

Learning outcomes:
- Understand the applications of Fourier series to Electrical circuits
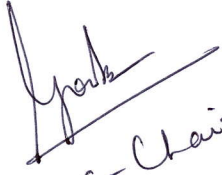- Understand different filters

Text Books:
1. Engineering circuit analysis by William Hayt, Jack E. Kemmerly and Jamie Phillips, Mc Graw Hill, 9th Edition, 2019.
2. Circuit Theory: Analysis & Synthesis by A. Chakrabarti, Dhanpat Rai & Sons, 2008.
3. Network Analysis by G K Mithal, Khanna Publishers, 2011.
4. Networks, Lines and Fields by John D. Ryder, Pearson Education, 2015

Reference Books:
1. Network Analysis by M.E. Van Valkenberg, Prentice Hall (India), 3rd Edition, 1980.
2. Electrical Engineering Fundamentals by V. Del Toro, Prentice – Hall International, 2009.
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 5th Edition, 2013.
4. Electric Circuits by Mahamood Nahvi and Joseph Edminister, Schaum's Series, 6th Edition, 2013.
5. Electrical Circuit Theory and Technology by John Bird, Routledge, Taylor & Francis, 5th Edition, 2014.

Course Outcomes: After completion of the course, the student will be able to:
- Understand the analysis of three phase balanced and unbalanced circuits
- Understand the Representation of circuits using two port parameters are known
- Understand the transient responses of R-L, R-C, R-L-C series circuits for D.C and A.C excitations
- Understand applications of Fourier series to electrical circuits excited by non-sinusoidal sources
- Understand the filters

(BoS - Chairman)