PX5152 ANALYSIS AND DESIGN OF POWER CONVERTERS

DETAILED SYLLABUS

UNIT I SINGLE PHASE & THREE PHASE CONVERTERS

Principle of phase controlled converter operation – single-phase full converter and semi- converter (RL, RLE load)- single phase dual converter – Three phase operation full converter and semi-converter (R, RL, RLE load) – reactive power – power factor improvement techniques –PWM rectifiers.

UNIT II DC-DC CONVERTERS

Limitations of linear power supplies, switched mode power conversion, Non-isolated DC-DC converters: operation and analysis of Buck, Boost, Buck-Boost, Cuk& SEPIC – under continuous and discontinuous operation – Isolated converters: basic operation of Fly back, Forward and Push-pull topologies.

UNIT III DESIGN OF POWER CONVERTER COMPONENTS

Introduction to magnetic materials- hard and soft magnetic materials –types of cores, copper windings – Design of transformer –Inductor design equations –Examples of inductor design for buck/fly back converter-selection of output filter capacitors – selection of ratings for devices – input filter design.

UNIT IV RESONANT DC-DC CONVERTERS

Switching loss, hard switching, and basic principles of soft switching- classification of resonant converters- load resonant converters – series and parallel – resonant switch converters – operation and analysis of ZVS, ZCS converters comparison of ZCS/ZVS Introduction to ZVT/ZCT PWM converters.

UNIT V AC-AC CONVERTERS

Principle of on-off and phase angle control – single phase ac voltage controller – analysis with R & RL load – Three phase ac voltage controller – principle of operation of cyclo converter – single phase and three phase cyclo converters – Introduction to matrix converters.

REFERENCE

1. Ned Mohan,T.MUndeland and W.P Robbin, “Power Electronics: converters, Application and design” John Wiley and sons.Wiley India edition, 2006.

2. Rashid M.H., “Power Electronics Circuits, Devices and Applications ", Prentice Hall India, Third Edition, New Delhi, 2004.

3. P.C. Sen, “Modern Power Electronics”, Wheeler Publishing Co, First Edition, New Delhi, 1998.

4. P.S.Bimbra, “Power Electronics”, Khanna Publishers, Eleventh Edition, 2003

5. Simon Ang, Alejandro Oliva, “Power-Switching Converters, Second Edition, CRC Press, Taylor & Francis Group, 2010

6. V.Ramanarayanan, “Course material on Switched mode power conversion”, 2007

7. Alex Van den Bossche and Vencislav Cekov Valchev, “Inductors and Transformers for Power Electronics”, CRC Press, Taylor & Francis Group, 2005

8. W. G. Hurley and W. H.Wolfle, “Transformers and Inductors for Power Electronics Theory, Design and Applications”, 2013 John Wiley & Sons Ltd.

9. Marian.K.Kazimierczuk and DariuszCzarkowski, “Resonant Power Converters”,

John Wiley & Sons limited, 2011.

OBJECTIVES

- To determine the operation and characteristics of controlled rectifiers.
- To apply switching techniques and basic topologies of DC-DC switching regulators.
- To introduce the design of power converter components.
- To provide an in depth knowledge about resonant converters.
- To comprehend the concepts of AC-AC power converters and their applications.