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Total Number of Pages : 02

M.TECH

M.TECH 1ST SEMESTER REGULAR EXAMINATIONS, DECEMBER 2017
POWER CONVERSION DEVICES AND DRIVES

Branch: PE, Subject Code:MPEPC1030

Time: 3 Hours

Max Marks : 70

The figures in the right hand margin indicate marks.

PART-A

(2X10=20 MARKS)

1. Answer the following questions .

- a. Differentiate between the CSI and VSI
- b. What are the types of electrical braking?
- c. Why stator voltage control is more suitable for speed control of induction motor in fan type load than constant type load?
- d. What is self-control of synchronous motor?
- e. A single phase full converter, connected to 230V,50 Hz source, is feeding a load $R=10\Omega$ in series with a large inductance that makes the load current ripple free. For a firing angle of 45° , calculate the input and output performance of this converter.
- f. What is Kron's primitive machine?
- g. How are the various windings of a machine represented by the primitive machine?
- h. Why IGBT is very popular nowadays?
- i. What is the function of freewheeling diodes in controlled rectifier?
- j. State the principle of Polyphase Induction machine

PART-B

(5 X 10=50 MARKS)

Answer any five questions from the following.

2. a. Draw the equivalent circuit for a single phase induction motor based on the two revolving Field theory and identify the various parameters involved in it.
- b. Derive the expressions for various self and mutual inductances of a three phase synchronous machine
3. a. Develop the state space voltage-current equation of synchronous machine
- b. A three phase salient pole synchronous generator without dampers is developing rated voltage at its terminals when running on no load .A three phase symmetrical short circuit occurs at the generator terminals. Neglecting all winding resistances, develop expressions for armature and field current following the short circuit as a function of time

4. a. Develop an expression for the resultant torque of a single phase induction motor running with slip s .
- b. Explain how the core losses are accounted for in determining the shaft power output.
5. a. Explain operation of single phase full wave fully controlled rectifier circuit with highly Inductive load and draw the following:
- Input voltage wave form
 - Input current wave form
 - Output voltage and current wave form
 - Voltage across a single SCR.
- b. A two pulse midpoint converter feeds an highly inductive load having a resistance of 15 ohms. It is fed from a 220V, 50Hz, source using a centre tapped transformer having a turns ratio 1:1 For a firing angle of 60 degrees determine
- The average output voltage and current
 - RMS value of primary current
 - RMS value of harmonic current
 - The power factor
 - The harmonic reactive power.
6. a. Explain the operation of a Three-Phase 12 Pulse converter along the necessary circuit Diagrams and wave forms.
- b. Evaluate the input power factor and harmonic factors for a Three-Phase half controlled converters
7. a. Which procedure is adopted to achieve soft start of induction motor using thyristor circuit? Justify your answer
- b. Draw & Explain the block diagram of constant V/F control using a square wave inverter
8. a. A star connected Squirrel cage IM has the following ratings: 440V, 50Hz, 1370rpm, $R_s=2$ Ohms, $R_r'=3$ Ohms, $X_s=X_r'=3.5$ ohms, $X_m=55$ ohms. It is controlled by a Current source inverter at constant flux. Calculate the Motor torque, Speed and Stator current when operating at 30Hz and rated slip speed
- b. Derive the expression for Thermal consideration of motor drive