

(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 131666

Roll No.

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B.TECH

Theory Examination (Semester-VI) 2015-16

INDUSTRIAL ELECTRONICS

Time : 3 Hours

Max. Marks : 100

Section-A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in sort. (2×10 = 20)

- (a) Define latching and holding current.
- (b) Why are IGBT and MOSFET voltage controlled devices?
- (c) What is the basis for selection of power semiconductor device for a particular application?
- (d) Define delay or firing angle.
- (e) Differentiate between line and forced commutation.

- (f) How is the output frequency varied in an inverter?
- (g) What is current limit control?
- (h) Draw the circuit diagram for a four-quadrant chopper fed DC drive.
- (i) What do you understand by V/F control?
- (j) Brief the role of damper winding in a synchronous motor.

Section-B

2. Attempt any five questions from this section.

(10×5 = 50)

- (a) Explain the two transistor analogy of thyristor.
- (b) Describe with a neat diagram the working of a depletion type p-channel MOSFET. Also, draw its V-I characteristics.
- (c) Justify the statement: “free wheeling diode improves the power factor of the system.”
- (d) With the aid of relevant waveforms, explain the operation of single-phase full bridge inverter.
- (e) Discuss the time ratio control strategy for the operation of choppers.

- (f) With the aid of power circuit, explain the step-down chopper configuration.
- (g) Compare AC drives with DC drives.
- (h) Enumerate the different methods of speed control of induction motor and explain any one of them.

Section-C

Note : Attempt any two questions in this section. (15×2 = 30)

- 3.
 - (i) Explain the construction, operation and V-I characteristics of IGBT.
 - (ii) Explain about the secondary breakdown in power transistors.
 - (iii) Write short notes on di/dt and dv/dt protection of thyristors.
- 4. The speed of a 20-hp, 300-V, 1800-rpm separately excited DC motor is controlled by a three-phase full-converter drive. The field current is also controlled by three-phase full converter and is set to a maximum possible value. The input is a three-phase, star-connected, 208-V, 60-Hz supply. The armature resistance is 0.25Ω ; the field resistance is 245Ω , and the motor voltage constant is $K_v = 1.2 \text{ V/A rad/s}$. The armature

and field currents can be assumed to be continuous and ripple free. The viscous friction is negligible. Determine

- (a) the delay of the armature converter if the motor supplies the rated power at rated speed
 - (b) no load speed if the armature current at no load is 10% of the rated values for the same delay angle
 - (c) the speed regulation
- 5.
- (i) Give the differences between 180° and 120° modes of three phase inverter with relevant waveforms of phase and line voltages.
 - (ii) Draw a suitable diagram and explain the working of slip power recovery system using Kramer drive.