**Printed Pages : 2** **Roll No.** | | | | | | | | | | | **MTED 202**

# M. TECH.
# THEORY EXAMINATION (SEM–II) 2016-17
# POWER CONVERTOR-II

***Time : 3 Hours*** ***Max. Marks : 70***

***Note :*** *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

## SECTION- A

**1. Attempt all parts of this Section :** **7×2=14**

**(a)** What are the conditions under which a power transisitor operates as a switch?

**(b)** Enlist the four futuristic applications of (MOS-controlled thyristorMCT).

**(c)** Write the expressions for average dc output voltage of buck and boost converters.

**(d)** What is the purpose of connecting diodes in anti parallel with thyristors in inverter circuits?

**(e)** What is resonant converter?

**(f)** Enlist two advantages and disadvantages of SMPS.

**(g)** Mention two important roles of drive circuit in controlled power system.

## SECTION- B

**2. Attempt any three parts of the following :** **3×7=21**

**(a)** Derive the equivalent circuit of IGBT from structural details. Also explain the switching characteristics of an IGBT.

**(b)** A dc battery is charged from a constant dc source of 220 V through a chopper. The dc battery is charged from its internal emf of 90 V to 122 V. The battery has internal resistance of 1 Ω. For a constant charging of 10 A, compute the range of duty cycle.

**(c)** Describe switched mode regulators using half-bridge and full-bridge configurations.

**(d)** A star connected load of 15 Ω per phase is fed from 420 V dc source through a 3-phase bridge inverter. For $120^0$ mode, determine rms value of load current, rms value of thyristor current and load power.

**(e)** Discuss the advantages of resonant converters over PWM controlled converters

## SECTION- C

**3. Attempt all questions in this section :** **5×7=35**

(a) A chopper connected to RLE load, write the basic voltage equations and derive the expressions for the maximum and minimum values of load current in terms of $V_s$, R, E etc. Hence derive the expression for per unit rippple in the load current.

**OR**



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A voltage commutated chopper delivers power to RLE load for which R=0 and L= 8mH. For a chopping frequency of 200 Hz and dc source voltage of 400 V, find the chopper duty cycle so as to limit the load current excursion to 40 A.

(b) What is the need of controlling the voltage at the output terminals of an inverter? Describe briefly and compare various methods employed for the control of output voltage of inverters.

**OR**

Explain the sinusoidal-pulse modulation as used in PWM inverters. Discuss the conditions under which the number of pulses generated per half cycle is $f_c/2f$ or $(f_c/2f - 1)$. Here $f_c$ and f are the frequencies of carrier and reference signals respectively.

(c) Explain the principle of ZVS resonant converter. Describe it with appropriate circuits and waveforms.

(d) What is a multi-phase chopper? Discuss the working of a load-commutated chopper with relevant voltage and current waveforms.

(e) Describe the significance of di/dt and dv/dt in thyristors. Snubber circuit for an SCR should primarily consists of capacitor only. But in actual practice, a resistor is used in series with the capacitor. Discuss.

**OR**

Describe a gate trigger circuit for a single-phase full converter. Discuss how the adjustment of control voltage varies the firing-delay angle.