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B.TECH
(SEM V) THEORY EXAMINATION 2019-20
POWER ELECTRONICS

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

a.	What do you mean by THD & VRF?
b.	What is the main difference between voltage source inverter and current source inverter?
c.	Define latching & holding current.
d.	Explain freewheeling diode and its effect.
e.	What are the merits and demerits of load commutated chopper?
f.	What do you mean by gate triggering method of SCR?
g.	What are the applications of rectifier circuit?
h.	What is meant by step-up cyclo-converters?
i.	Derive the following for a single phase semiconverter $V_o = \sqrt{2}V_s (1 + \cos\alpha) / \pi$
j.	What do you mean by total harmonic distortion of an inverter?

SECTION B**2. Attempt any three of the following:****10x3=30**

a.	A 3 phase full converter fed from 3 phase 400 V, 50 Hz source, is connected to load $R = 10 \Omega$, $E = 350$ V and large inductance so that output current is ripple free. Calculate the power delivered to load and input p.f. for i. firing angle of 30° and ii. firing advance angle of 60° .
b.	Explain the two transistor model of thyristor & dv/dt protection scheme.
c.	A three phase bridge inverter delivers power to resistive load from a 450V dc source. For a star connected load of 10Ω per phase, determine for both (a) 180° mode (b) 120° mode. i. rms value of load current ii. rms value of thyristor current iii. Load power
d.	Describe the working of IGBT with the switching characteristics?
e.	Describe the principle of integral(on- off) cycle control of ac voltage controllers

SECTION C**3. Attempt any one part of the following:****10x1=10**

a.	Describe the operating principle of single phase half and full bridge inverter.
b.	Describe single phase to single phase step down midpoint cycloconverter.

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4. Attempt any *one* part of the following:**10x1=10**

a.	Discuss the principle of operation of step down chopper. Explain various control strategies to control output voltage of step down chopper.
b.	What are dual convertors? Explain operation of a 1- ϕ phase dual converter using circulating current mode of operation.

5. Attempt any *one* part of the following:**10x1=10**

a.	A single phase half wave AC voltage controller has input voltage of 230V, 50 Hz, and load of $R=20\Omega$. For a firing angle delay of 45° , calculate (i) rms value of output voltage (ii) Power delivered to load & i/p power factor (iii) Average i/p current
b.	For type A chopper, dc source voltage = 230 V, load resistance = 10Ω . Take a voltage drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate (i) average and rms values of output voltage (ii) chopper efficiency

6. Attempt any *one* part of the following:**10x1=10**

a.	A single phase full converter is feeding to a RLE load, the source voltage is 230V, 50Hz and avg. load current is 10A. For $R=0.4$ and $L=2\text{mH}$, compute (i) Firing angle delay for $E=120\text{V}$ (ii) Firing angle delay for $E=-120\text{V}$ (iii) I/P power factor for both parts (i) and (ii).
b.	Describe three phase 120° mode voltage source inverter. Also explain its advantages over 180° mode voltage source inverter.

7. Attempt any *one* part of the following:**10x1=10**

a.	Describe type-A chopper with its operation. For type-A chopper, source voltage $V_s=220\text{V}$, chopping frequency $f=500\text{Hz}$, $T_{\text{on}}=800\mu\text{s}$, $R=1\Omega$, $L=1\text{mH}$ and $E=72\text{V}$. (i) Find whether load current is continuous or not. (ii) Calculate the values of average output voltage and average output current.
b.	A 230 V, 50 Hz one-pulse SCR controlled converter is triggered at a firing angle of 40° and the load current extinguishes at an angle of 210° . Find the circuit turn off time, average output voltage and the average load current for (i) $R=5\Omega$ and $L=2\text{mH}$ (ii) $R=5\Omega$, $L=2\text{mH}$ and $E=110\text{V}$