Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech**
PCEL4301

5th Semester Back Examination 2017-18
Power Electronics
BRANCH:ELECTRICAL
Time: 3 Hours
Max Marks: 70
Q.CODE: B244

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) Name two different Power semiconductor device having Highest switching speed and having Easy drive and High power handling capability respectively.
b) What dou mean by Displacement Factor of a Rectifier (DPF).
c) Inverter grade thyristors have _____ turn off time compared to a converter grade thyristor.
d) What are the various protection schemes provided for a power semiconductor device.
e) Why pulse triggering is preferred to dc triggering?
f) The gate drive unit of a GTO should provide continuous positive gate _____ during ON period and continuous negative gate _____ during OFF period.
g) The sum of firing angle, extinction angle and overlap angle of a controlled rectifies is _____
h) Why discontinuous mode of current seen in the load in controlled rectifier systems.
i) What is the function of feedback diode and where is it used?
j) What are the advantages of free wheeling diode in a phase controlled converter?

Q2 **a)** A single-phase transformer, with secondary voltage of 230 V, 50 Hz, delivers power to load R=10 ohms through a half-wave controlled rectifier circuit. For a firing-angle delay of 60^0, determine (a) the rectifier efficiency (b) form factor (c) voltage ripple factor (d) transformer utilization factor and (e) PIV of thyristor **(5)**

b) Sketch switching characteristics of an SCR during its turn-on and turn-off processes. **(5)**

Q3 **a)** Snubber circuit of an SCR should primarily consist of a capacitor but a resistor is used in series with it. Discuss why it is so. **(5)**

b) Draw and explain the steady state characteristics of a Triac switch and draw also the triggering circuit of a Triac. **(5)**

Q4 **a)** Draw the output voltage , load current, input current wave form for a single phase, fully controlled rectifier containing R-L-E load in continuous mode operation . Also find the DC voltage and rms value nth harmonic voltage its output voltage. **(5)**

b) A step up chopper has input voltage of 220 V and output voltage of 660 V. if the conducting time of thyristor chopper is 100 μs, compute the pulse width of output voltage. In case out put voltage pulse width is halved for constant frequency operation, find the average value of new output voltage. **(5)**

Q5 **a)** A three phase full wave rectifier operates from 220 volts, three phase 50 Hz supply and supplies a capacitive resistive load of 20 Amps. An inductor of negligible resistance is inserted between the rectifier and the capacitor. Assuming the capacitor to be large enough so that the output voltage is almost ripple free. Calculate the value of the inductor so that the rectifier output current is continuous. **(5)**

b) Discuss inverting mode of operation of single phase full wave controlled rectifier. **(5)**

Q6 **a)** With waveforms, explain the working of a single phase AC voltage controller. **(5)**

b) A 200V, 1450 RPM, 100A separately excited dc machine has an armature resistance of 0.04Ω. The machine is driven by a three phase half controlled converter operating from a three phase 220V, 50Hz supply. The motor operates at the rated speed and rated load torque. Assuming continuous conduction find out (i) the firing angle of the converter; (ii) RMS fundamental component of the input current, (iii) Input current displacement factor and distortion factors. **(5)**

Q7 Draw and explain for three phase voltage source bridge type of inverter operating under 180^0 mode. **(10)**

Q8 **Write short answer on any TWO:** **(5 x 2)**

a) SMPS

b) Single phase cycloconverter.

c) SVC

d) Dual converter