Registration No: -

Total Number of Pages: 02

B. Tech
PEE5I101/ PEL5I101

5th Semester Regular / Back Examination: 2021-22
POWER ELECTRONICS
Branch: ELECTRICAL/ EEE
Max Marks: 100
Time: 3 Hours
Q Code: OF231

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1	**Only Short Answer Type Questions (Answer All-10)**	(02×10)
a)	What are the conditions for a thyristor to conduct?	(2)
b)	What is the importance of snubber circuit?	(2)
c)	What is freewheeling diode and what is its purpose?	(2)
d)	What is the importance of blanking time in an inverter?	(2)
e)	How does light triggering of a thyristor differ from gate triggering?	(2)
f)	Can you achieve zero degree firing angle for a SCR? Justify.	(2)
g)	Define latching current and holding current of a thyristor .	(2)
h)	What are the advantages of bipolar switching over unipolar switching in SPWM control strategy as applied to inverters?	(2)
i)	What are the advantages of soft switched converters over hard switched converters?	(2)
j)	What are the benefits of cuk converters over buck boost converter?	(2)

Part- II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	(06×08)
a)	Draw and explain the switching behavior of power MOSFET.	(6)
b)	How is SCR protected against dv/dt and di/dt? Explain with relevant circuit diagram.	(6)
c)	A single phase 220V, 1KW electric room heater is connected across 220V, 50HZ supply through a triac. For a firing delay angle of 90°, calculate the power dissipated by the heater element.	(6)
d)	For a buck boost converter the input dc voltage is 14V. The duty cycle is 0.6 with switching frequency of 25KHZ.The inductance L=180μH and filter capacitance C=220 μF. If the average load current is 1.5A, Compute (i) The average output voltage (ii) Peak to peak output voltage ripple (iii) Peak to peak current in the inductor (iv)The peak current of the device	(6)
e)	Describe RC full wave triggering circuit for a single SCR.	(6)
f)	Derive expressions for the average and r.m.s values of the output voltage waveform of single phase full wave converter.	(6)
g)	Describe the principle of step up chopper. Derive an expression for the average output voltage in terms of input voltage and duty cycle.	(6)
h)	A single phase full bridge rectifier having a supply voltage of $V_m \sin(wt)$ has a purely resistive load R. Determine a) efficiency b) the form factor c) the ripple factor d) the transformer utilization factor e) the peak inverse voltage of diode f) the crest factor of input current	(6)
i)	A single phase fully controlled rectifier has 200 sin (314t) as input supply voltage and resistor R as load. What will be the average output voltage for firing angle 30° for this rectifier?	(6)
j)	The parameters of UJT are V_s= 30 v, η =0.51 , I_P=10μA, V_V =3.5V and I_v =10m A .The frequency of	(6)

oscillation is f=60HZ , and the width of triggering pulse is tg = 50μs. Assume V_D =0.5. Design the triggering circuit .

k) Explain the operation of SMPS. (6)

l) What is a GTO. Describe its basic structure. (6)

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) (02×16)

Q3 A single-phase Semi converter feed power to RLE load. For discontinuous load current, draw the output voltage, load current, source current and freewheeling diode current waveforms as a function of time when (16)
(i) Extinction angle $\beta \geq \Pi$ (ii) $\beta < \Pi$ with $V_m \sin \beta < E$

Q4 Write short notes on (16)
(i) Sinusoidal PWM
(ii) Comparison between power MOSFET and BJT

Q5 Explain 180° conduction scheme of a three phase voltage source inverter with relevant circuit diagram and waveform. (16)

Q6 Describe the circuit operation of four-quadrant chopper with relevant circuit diagrams and its operation in all the four quadrants . (16)