



B.Tech - Odd Sem : End Semester Exam
Academic Year:2020-2021
18EE3101 - Power Electronics
Set No: 1

Time:		Max.Marks: 100					
S.NO	Answer All Questions	Choice	Options	Marks	CO	CO BTL	COI BTL
1.	Illustrate the ideal characteristics of a switch employed in Power electronic converter with circuit and waveforms.	choice Q-2		10Marks	CO1	2	2
2.	Construction-wise, how IGBT is different from MOSFET, and what operational advantage it derives with respect to other controlled devices.			10Marks	CO1	2	2
3.	Elaborate on the dynamic characteristics of Power MOSFET with the help of junction capacitance and necessary circuit diagram waveforms.	choice Q-4		15Marks	CO1	2	2
4.	Identify the reasons for the delay in the Turn-on and Turn-off process of SCR and highlight the parameters on which factor it depends on switching characteristics.			15Marks	CO1	2	2
5.	Derive expressions of inductor current ripple and capacitor voltage ripple from the basic concepts of dc-dc converter, whose output voltage V either greater than or less than source voltage V_s .	choice Q-6		10Marks	CO2	4	3
6.	For the Buck converter, deduce the expressions of inductor current ripple, capacitor voltage ripple, and minimum value of inductance required for continuous conduction. Also, draw the necessary waveforms.			10Marks	CO2	4	4
7.	The buck converter has an input of 50 V and an output of 25 V. The switching frequency is 40 kHz, and the output power to a load resistor is 125 W. (a) Determine the duty ratio. (b) Determine the value of inductance to limit the peak inductor current to 6.25 A. (c) Determine the value of capacitance to limit the output voltage ripple to 0.5 percent.	choice Q-8		15Marks	CO2	4	4
8.	Design a boost converter to provide an output of 18 V from a 12 V source. The load is 20 W. The output voltage ripple must be less than 0.5 percent. Specify the duty ratio, the switching frequency, the inductor size and load current rating, the capacitor size. Design for continuous current. Assume ideal components.			15Marks	CO2	4	4
9.	Draw the circuit diagram and waveforms of 3 phase inverter. Also, derive the expressions for rms phase voltage and line voltage for 3 phase inverter in 120 degrees mode of operation.	choice Q-10		10Marks	CO3	4	3
10.	Develop the output phase and line voltage waveforms for a 180-degree mode of operation and derive the phase and line voltages of the inverters.			10Marks	CO3	4	3
11.	Determine the magnitude of the Lowest order harmonic LOH and fundamental output phase voltage and line	choice Q-12		15Marks	CO3	4	4

	voltage of a 3ph inverter supplied by 48V supply and controlled in 180-degree mode of conduction. Also, express the instantaneous line-to-line voltage V_{ab} in the Fourier series.						
12.	A single-phase full-bridge inverter is supplied from the source of $V_{dc}=300V$ and the fundamental output frequency is 50Hz. Determine the load voltage and current T.H.D and LOH, if it is operated in Square wave mode.			15Marks	CO3	4	4
13.	Derive an expression for i) average load voltage ii) average load current iii) RMS load voltage and current of 1-phase half-controlled (semi) converter with inductive load. iv) Rectification efficiency, v) TUF.	choice Q-14		10Marks	CO4	2	2
14.	Illustrate the working principle of 1-phase to 1-phase bridge-type step-down cyclo-converter feeding an RL load with $f_o=1/3 f_s$. Draw necessary waveforms.			10Marks	CO4	2	2
15.	The full converter is connected to a 120-V, 60-Hz supply. The load current I_a is continuous and its ripple content is negligible. The turn's ratio of the transformer is unity. (a) Express the input current in a Fourier series; determine the HF of the input current, DF, and input PF. (b) If the delay angle is $\alpha = \pi/6$, calculate V_{dc} , V_n , V_{rms} , HF, DF, and PF.	choice Q-16		15Marks	CO4	2	2
16.	For the 3 - phase fully controlled converter operation from 3 - phase, 415 V, 50 Hz supply with resistive load, i) Compute the average output voltage for $\alpha = 0^\circ, 30^\circ, 60^\circ, 90^\circ$, and 120° . ii) Plot V_{dc} Vs α . iii) thyristor average and rms current.			15Marks	CO4	2	2

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