


Name:			
Enrolment No:			
UPES End Semester Examination, December 2023			
Course: Power Electronics and Drives Program: B.Tech (Mechatronics Engineering) Course Code: ECEG4035		Semester: VII Time : 03 hrs. Max. Marks: 100	
Instructions: Assume the data if missing.			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	Define holding current and latching current of SCR. Show these currents on the static v-i characteristics of SCR.	4	CO1
Q2	What are the advantages of electrical drive? Give the advantages of chopper fed dc drives over rectifier fed dc drives.	4	CO5
Q3	Write the difference between half controlled converter and a full controlled converter. With the help of circuit diagram and waveform explain the operation of both converters.	4	CO2
Q4	Draw a single-phase inverter for RL load and make the relevant waveforms.	4	CO4
Q5	A step-up chopper is supplied through a source of 400 V and operated at a duty cycle of 25%. Find the average output voltage of the chopper.	4	CO3
SECTION B (4Qx10M= 40 Marks)			
Q6	Explain the working of single-phase dual converter with circulating current mode and define the different region of working.	10	CO2
Q7	A 200V, 875rpm, 150A separately excited dc motor has an armature resistance of 0.06ohm. It is fed from a single phase fully controlled rectifier with an ac source of 220V, 50Hz. Assuming continuous	10	CO5

	conduction, calculate (i) Firing angle for rated motor torque and 750rpm. (ii) Motor speed for $\alpha=1600$ at rated torque.		
Q8	For a type A chopper, dc source voltage is 230 V, load resistance 10 Ω , drop across the switch is 2V and duty cycle 0.4. Calculate average and RMS value of output voltage and chopper efficiency.	10	CO3
Q9	Design an R triggering circuit for one thyristor and with the help of circuit diagram and waveform, explain the operation.	10	CO1
SECTION-C (2Qx20M=40 Marks)			
Q 10	A single-phase half bridge inverter has a resistive load of 2.4W and the dc input voltage of 48V. Determine: (i) RMS output voltage at the fundamental frequency (ii) Output power P ₀ (iii) Average and peak currents of each transistor (iv) Peak blocking voltage of each transistor (v) Total harmonic distortion and distortion factor (vi) Harmonic factor and distortion factor at the lowest order harmonic.	20	CO4
Q11	For a 3-phase delta connected 6-pole 50 Hz 400 V, 925 rpm squirrel cage induction motor is having R ₁ = 0.2 Ω , R ₂ = 0.3 Ω , X ₁ = 0.5 Ω and X ₂ = 1.1 Ω . The motor is operated from voltage source inverter with constant V/f ratio from 0 to 50 Hz and having a constant voltage of 400 V above 50 Hz frequency. Calculate: i). speed for a frequency of 35 Hz with half full load torque. (i) ii). Torque for a frequency of 35 Hz for a speed of 650 rpm. OR Show that the controlled half-wave rectifier and full wave rectifier with a resistive load have the power factor of $pf_{HW} = \sqrt{\frac{1}{2} - \frac{\alpha}{2\pi} + \frac{\sin 2\alpha}{4\pi}}$ and $pf_{FW} = \sqrt{1 - \frac{\alpha}{\pi} + \frac{\sin 2\alpha}{2\pi}}$ Also, explain the significance of power factor in rectifier circuits.	20	CO5