

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Power Electronics & Drives	Semester: V sem
Program: B tech Electrical Engg	Time 03 hrs.
Course Code: EPEG 3002	Max. Marks: 100
Instructions: Answer All Questions	

SECTION A

S. No.	Answer All Questions	Marks	CO
Q 1	A voltage commutated chopper feeds power to a battery powered electric car. The battery voltage is 60 V, starting current is 60 A and thyristor turn-off time is 20 micro sec. calculate the values of the commutating capacitor C and the commutating inductor L.	5	CO1
Q 2	Define latching and holding currents as applicable to an SCR. Show these currents on its static I-V characteristics.	5	CO1
Q 3	A separately excited dc motor, operating from a single phase half-controlled bridge at a speed of 1400 rpm, has an input voltage of $330 \sin 314t$ and a back emf 80V. The SCRs are fired symmetrically at $\alpha=30^\circ$ in every half cycle and the armature has a resistance of 4 ohms. Calculate the average armature current and the motor torque.	5	CO2
Q 4	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 micro sec, compute the pulse width of output voltage. In case output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage.	5	CO2

SECTION B

Q 5	A 3-phase to single phase cyclo-converter employs 3-pulse positive and negative group converters. Each converter is supplied from delta/star transformer with per phase turns ratio of 2:1. The supply voltage is 400 V, 50 Hz. The RL load has R=2 ohms and thyristor turn-off time, the firing angle in the inversion mode. Should not exceed 160° . Compute <ul style="list-style-type: none"> (i) The value of the fundamental rms output voltage (ii) rms output current (iii) output power 	10	CO3
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(OR)

Q 5	A single phase bridge type cyclo-converter has input voltage of 230 V, 50 Hz and load of R=10 ohms. Output of frequency is one-third of input frequency. For a firing angle	10	CO3
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	delay of 30° , calculate (a) rms value of output voltage (b) rms current of each converter (c) rms current of each thyristor and (d) input power factor.		
Q 6	(a) Explain complementary impulse commutation with a circuit diagram and appropriate wave forms. (b) Derive expressions for current through and voltage across commutating capacitor. Find the circuit turn-off times for the complementary thyristors.	10	CO2
Q 7	A 3-phase full converter, fed from 3-phase, 400 V, 50 Hz source is connected to load $R=10$ ohms, $E=350$ V and large inductance so that output current is ripple free. Calculate the power delivered to load and input power factor for (a) firing angle of 30° and (b) firing advance angle of 60° .	10	CO3
Q 8	A single phase full bridge diode rectifier is supplied from 230 V, 50 Hz source. The load consists of $R=10$ ohms and a large inductance so as to render the load current constant. Determine: (i) average values of output voltage and output current (ii) average and rms values of diode currents (iii) rms values of output and input currents, and supply pf.	10	CO2
SECTION-C			
Q 9	Sketch switching or dynamic characteristics of a thyristor during its turn-on and turn-off processes. Show the variation of voltage across the thyristor and current through it during these two dynamic processes. Indicate clearly the various intervals into which turn-on and turn-off times can be subdivided.	20	CO2
Q 10	A 220 V, 1000 rpm, 60 A separately excited dc motor has an armature resistance of 0.1 ohms. It is fed from a single phase full converter with an ac source voltage of 230 V, 50 Hz. Assuming continuous conduction, compute: (i) Firing angle for rated motor torque at 600 rpm (ii) Firing angle for rated motor torque at (-500) rpm (iii) Motor speed for $\alpha=150^\circ$ and half-rated torque.	20	CO4
(OR)			
Q 10	A separately excited dc motor drives a rated load torque of 85Nm at 1200rpm. The field circuit resistance is 200Ω and armature circuit resistance is 0.2Ω . The field winding connected to 1- ϕ 400V source is fed through 1- ϕ full converter with 0° firing angle. The armature circuit is also fed through another full converter from the same 1- ϕ 400V source. With magnetic saturation neglected and the motor constant is 0.8V-sec/A-rad. For ripple free armature and field currents, determine a. Rated armature current b. Firing angle delay of armature converter at rated load c. Speed regulation at full load d. Input pf of armature converter and drive at rated load.	20	CO4