


Name:			
Enrolment No:			
UPES End Semester Examination, May 2024			
Course: Power Electronic Converters for E-Vehicles Program: B.Tech (Electrical Engineering) Course Code: EPEG 3027		Semester: VI Time : 03 hrs. Max. Marks: 100	
Instructions: Read all the questions carefully. Assume if any data is missing.			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	A 200V DC shunt motor runs at 600 rpm when the armature current is 30A. Calculate the speed if the torque is doubled. Given that $R_a = 0.18\Omega$.	4	CO2
Q 2	List out the different isolated converter topologies used in EVs.	4	CO2
Q 3	Compare conventional vehicle with hybrid electric vehicle.	4	CO1
Q 4	Draw the circuit diagram and explain the operation of a full bridge push pull converter.	4	CO2
Q 5	Can EV batteries be replaced? Write the names of different types of batteries used in electric vehicles?	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q 6	Illustrate Capacitive Wireless Charging System (CWCS) in detail.	10	CO3
Q 7	Explain the two-quadrant operation of chopper DC motor drive with suitable waveforms for electric vehicle.	10	CO3
Q 8	In a buck-boost converter, the switching frequency is 20 kHz. The input and output voltages are 20 V and 50 V, respectively. If the average source current is 10 A and peak-to-peak inductor current is 30A, find the value of inductance and load resistance.	10	CO4
Q 9	Develop a full wave rectifier connected to an EV (RLE) load and draw the various waveforms.	10	CO3
SECTION-C (2Qx20M=40 Marks)			
Q 10	Explain the principle of operation of a Buck Boost Converter with circuit diagram showing the various modes. Derive the expression for output voltage and continuous inductor current and capacitor current.	20	CO4
Q 11	Design a Buck-Boost converter circuit having parameters, input voltage =24 V, $D= 0.4$, load resistance =5ohm, $L=20$ micro-H, $C=80$ micro-F.	20	CO4

	<p>Determine the output voltage, average inductor current, maximum, and minimum value of inductor current and the output voltage ripple. Assume a switching frequency of 100 kHz.</p>		
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OR

Explain the principle of operation of a forward converter with transformer equivalent circuit. Draw circuit diagram, waveforms and show the various subintervals.