K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:IV
Class:SY	Program:B.Tech
Branch Code:ELE	Pattern:2023
Name of Course:Power Electronics	Course Code:2306213
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 03 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.

		Marks	**CO**
Question No. 1			
1a)	A single phase fully controlled converter fed from AC supply is used to control DC voltage across with RL load where inductance is very high to maintain constant current, If AC source voltage is 200V rms, calculate the firing angle to produce average output voltage (i) 100V (ii) -100V	(6)	CO2
Question No. 2			
2a)	(i) Compare MOSFET with IGBT. **(3 Marks)** **(ii)** Compare SCR with TRIAC. **(3 Marks)**	(6)	CO1
Question No. 3			
3a)	In a buck-boost converter show that $\frac{V_0}{V_S} = \frac{D}{1 - D}$ with the help of circuit diagram and waveform.	(8)	CO2
	OR		
3b)	In a boost converter show that $\frac{V_0}{V_s} = \frac{1}{1 - D}$ with the help of circuit diagram and waveform.	(8)	CO2

3c) Design a buck converter with following specifications (8) CO4
Input voltage=36V
Output voltage=24V
Output power=100W
Allowable ripple in output voltage 1% of average output voltage
Allowable in ripple in inductor current is 15% of load current.
Switching frequency=75kHz

OR

3d) Design a buck-boost converter to transfer battery to motor of electric vehicle with following specifications (8) CO4
Battery output voltage=48V.
Motor specification= 200W at 36V
Allowable ripple in output voltage 2% of average output voltage
Allowable in ripple in inductor current is 15%.
Switching frequency=75kHz

Question No. 4

4a) A step down chopper is having input 200V and it used to control a motor of 100V. If switching frequency is 10kHz, calculate (8) CO3

(i) Duty cycle **(1 Marks)**

(ii) Pulse width **(1 Marks)**

(iii) Output voltage, if the pulse width is reduced to half keeping switching frequency constant. **(3 Marks)**

(iv) Pulse width required, if the required output voltage is 150V with same switching frequency. **(3 Marks)**

OR

4b) A step up chopper is having input 75V and it used to control a motor of 100V. If on time of chopper is 100μsec, calculate (8) CO3
(i) Duty cycle **(1 Marks)**
(ii) Switching frequency **(1 Marks)**
(iii) Output voltage, if the pulse width is reduced to half keeping switching frequency constant. **(3 Marks)**
(iv) Pulse width required, if the required output voltage is 150V with same switching frequency. **(3 Marks)**

4c) Draw the circuit diagram of single phase AC voltage regulator connected to RL load. Explain the working with the help of waveform. (8) CO3

OR

4d) A single phase AC voltage regulator is used in R load. (8) CO3
(i) Derive the rms output voltage current and power for given circuit. **(5 marks)**
(ii) If input voltage is 230V, 50Hz and load is 1000W at unity power factor, calculate rms output voltage and current. Firing angle is 45 degree. **(3 marks)**

Question No. 5

5a)	Derive the instantaneous output voltage of single phase half bridge inverter using Fourier analysis and show that only odd harmonics are present in the output.	(8)	CO3

OR

5b)	For a single phase full bridge voltage source inverter is used to control restive load of 1000W from a battery of 100V. Calculate: (i) rms output voltage **(2 Marks)** (ii) fundamental rms output voltage **(2 Marks)** (iii) fundamental output current **(2 Marks)** (iv) Total harmonic distortion (THD) **(2 Marks)**	(8)	CO3
5c)	Draw the circuit diagram and waveform for three voltage source inverter with 180 degree of conduction. Explain the working of the same.	(8)	CO2

OR

5d)	Draw the circuit diagram and explain working of cascaded multilevel inverter	(8)	CO2

····· End of question paper·····