

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Code No. : 16337

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD***Accredited by NAAC with A++ Grade***B.E. (E.E.E.) VI-Semester Main & Backlog Examinations, June-2022****Power Electronics**

Time: 3 hours

Max. Marks: 60

*Note: Answer all questions from Part-A and any FIVE from Part-B***Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO
1.	Define Latching and Holding Current.	2	1	1	1
2.	Sketch the dynamic v-i characteristics of SCR and indicate turn-ON and turn-OFF times.	2	1	1	1
3.	With relevant waveforms, differentiate continuous and discontinuous conduction operation of single phase fully controlled bridge rectifier.	2	4	2	2
4.	Find the input power factor of a single-phase full converter operating at a firing angle $\alpha = 30^\circ$ .	2	3	2	2
5.	List the applications of step-up choppers.	2	1	3	1
6.	Draw the circuit diagram of Buck Boost converter and write the output voltage expression.	2	1	3	2
7.	Single phase full bridge inverter has a resistive load of $R = 2.4$ ohms and DC input voltage of 48 volts. Calculate the RMS output voltage at fundamental frequency.	2	4	4	2
8.	Draw the circuit diagram of single-phase half bridge inverter with RL load.	2	1	4	1
9.	Compare $180^\circ$ conduction mode and $120^\circ$ conduction mode of three phase voltage source inverter.	2	3	5	2
10.	Draw the waveforms of single phase half wave ac voltage controller with R-load with $\alpha = 30^\circ$ .	2	1	5	1
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	Draw the gate characteristics of a SCR and explain its importance in the design of gate drive circuit.	4	1	1	2
b)	Describe the static V-I characteristics of power MOSFET and power IGBT.	4	2	1	2
12. a)	Explain the operation of single phase half wave controlled rectifier with RL- load. Derive the expression for average dc output voltage.	4	2	2	2
b)	A single-phase half wave controlled rectifier is connected to R load of $10 \Omega$ . The converter is supplied from 230 V, 50 Hz ac supply (i) determine average and rms load voltage (ii) calculate the power consumed by $10 \Omega$ resistor. Assume the firing angle of thyristor $\alpha = 30^\circ$ .	4	4	2	2

13. a)	Explain the operation of step-down chopper with a suitable diagram. Also sketch the voltage and current waveforms.	4	2	3	2
b)	A boost converter has an input voltage of 6 V, the required output voltage is 18 V, the average load current is 0.4 A and the switching frequency is 20 kHz. If the filter inductance and the filter capacitance values are 350 $\mu$ H and 520 $\mu$ F respectively, determine (a) duty cycle (b) ripple current of the inductor (c) ripple voltage of the filter capacitor.	4	4	3	2
14. a)	Explain the operation of single phase full bridge voltage source inverter with R-load.	4	2	4	2
b)	A single pulse width modulation (PWM) of PWM inverter the pulse width is $120^\circ$ . For an input voltage of 220 V dc, determine the RMS value at fundamental component of the output voltage and total harmonic distortion (THD).	4	4	4	2
15. a)	Explain the operation of three phase voltage source inverter (VSI) with star connected resistive load in $120^\circ$ conduction mode of operation with neat circuit and relevant waveforms.	4	2	5	2
b)	Explain the principle of integral cycle control of AC voltage controller with relevant waveforms and also derive the expression for rms value of output voltage.	4	3	5	2
16. a)	What are the different TURN-ON methods of a thyristor? Explain each method.	4	2	1	2
b)	A single phase fully controlled bridge converter with RL load is supplied from 220 V, 50 Hz ac supply. If the firing angle is $45^\circ$ , determine i) average output voltage, ii) output current iii) input power factor. Assume that the converter is operating in continuous conduction.	4	4	2	2
17.	Answer any <i>two</i> of the following:				
a)	With the help of neat circuit diagram and associated waveforms discuss the operation of a Boost converter in continuous conduction mode and sketch the waveforms of supply voltage, inductor voltage, inductor current, capacitor voltage and capacitor current.	4	2	3	2
b)	Discuss various PWM techniques used in inverters. How sinusoidal PWM is useful in the harmonic elimination?	4	3	4	2
c)	Explain the operation of single phase step-down cyclo-converter.	4	2	5	2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

\*\*\*\*\*

S.L. EEE