



# P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Feb. - 2021

Power Electronics

Time: 3 hrs

Max. Marks: 100

## Course Outcomes

The Students will be able to:

CO1: Identify Nature and characteristics of management, early management & modern management approaches. Hierarchy of plans, importance & purpose of plans, planning and planning premises.

CO2: Distinguish Types of organizations, authority & responsibility, leadership styles, methods of sound control, techniques of co-ordination.

CO3: Structure Different types of entrepreneurs, stages in entrepreneurial process, role of entrepreneur in economic development.

CO4: Objectives, Scope and role of SSI in Economic Development, Different Policies of SSI, Impact of Liberalization, Privatisation, and Globalization on SSI, Ancillary Industry and Tiny Industry.

CO5: Analyse Need and significance of project report, Market Feasibility Study: Technical Feasibility Study, Financial Feasibility Study & Social Feasibility study.

**Note: I) PART - A** is compulsory. **Two** marks for each question.

**II) PART - B:** Answer any **Two** sub questions (from a, b, c) for Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
<b>PART - A</b>		<b>10</b>			
1 a.	Why isolation is necessary in power electronic circuits?	2	L1	CO1	PO1
b.	What are the peripheral effects of power electronic equipment?	2	L1	CO2	PO1
c.	What is AC voltage controller?	2	L1	CO3	PO1
d.	What is step-up chopper?	2	L1	CO4	PO1
e.	List the advantages of freewheeling diode.	2	L1	CO5	PO1
<b>PART - B</b>		<b>90</b>			
<b>UNIT - I</b>		<b>18</b>			
1 a.	i) Explain any four power electronic converter circuits with their circuit, input and output waveforms.	6	L2	CO1	PO2
	ii) Make the comparisons between BJT and MOSFET.	3	L2	CO1	PO8
b.	Sketch and explain the switching characteristics of IGBT.	9	L2	CO1	PO2
c.	i) With neat wave forms, explain the switching characteristics of power MOSFET.	6	L2	CO1	PO2
	ii) Mention two applications of each power electronic converter.	3	L1	CO1	PO8
<b>UNIT - II</b>		<b>18</b>			
2 a.	Sketch and explain the switching characteristics of SCR.	9	L2	CO2	PO2
b.	i) Briefly explain the necessity of series connection of thyristors.	5	L2	CO2	PO2
	ii) Design a UJT relaxation oscillator using UJT2646 for triggering an SCR. The UJT has the following parameters: $\eta = 0.63$ , $V_{BB} = 20\text{ V}$ , $V_P = 13.2\text{ V}$ , $I_P = 50\ \mu\text{A}$ , $V_V = 2\text{ V}$ , $I_V = 6\text{ mA}$ , $R_{BB} = 7\text{ k}\Omega$ , leakage current = 2.5 mA. Also find the minimum and maximum time period of oscillation.	4	L6	CO2	PO3

c. i) Using two transistor analogy, explain the principle of switching on of an SCR.	6	L2	CO2	PO1
ii) Explain the operation of Snubber circuit.	3	L2		PO1
<b>UNIT - III</b>				
<b>18</b>				
3 a. Explain the working of a resonant pulse SCR commutation circuit with necessary diagram and waveforms.	9	L2	CO3	PO1
b. i) An AC voltage controller has a resistive load of $R = 10 \Omega$ and rms input voltage is $V_s = 120 \text{ V}$ , 60 Hz. The thyristor switch is ON for $n = 25$ cycles and OFF for $m = 75$ cycles. Determine; The RMS output voltage and input power factor	6	L6	CO3	PO2
ii) Distinguish between line commutation and forced commutation	3	L4	CO3	PO1
c. Explain the operation of single phase bidirectional AC voltage controller for resistive load.	9	L2	CO3	PO2
<b>UNIT - IV</b>				
<b>18</b>				
4 a. Derive an expression for average and rms value of the load voltage for the step down chopper having inductive load.	9	L1	CO4	PO4
b. i) Explain the operation of a $1\phi$ full wave bridge inverter.	6	L2	CO4	PO2
ii) Write a note on performance parameters on inverters.	3	L1		PO1
c. With necessary circuit and waveforms, explain three phase bridge inverter in $120^\circ$ mode.	9	L2	CO5	PO2
<b>UNIT - V</b>				
<b>18</b>				
5 a. Mention the applications of converters. Explain the principle of operation of $1-\phi$ half wave converter with RL load. Derive an expression for its output voltage.	9	L2	CO5	PO2
b. With relevant circuit and waveforms, explain the operation of $1-\phi$ dual converter.	9	L2	CO5	PO2
c. i) With neat circuit and waveforms, explain the working principle of 3-half wave controlled rectifier with R load.	6	L2	CO5	PO2
ii) A $1-\phi$ half wave converter is operated from a 120 V, 50 Hz supply and the load resistance $R = 10\Omega$ . If the average output voltage is 25% of the maximum possible average output voltage calculate delay angle $\alpha$ .	3	L6	CO5	PO2