CBCS Scheme: 2015-16

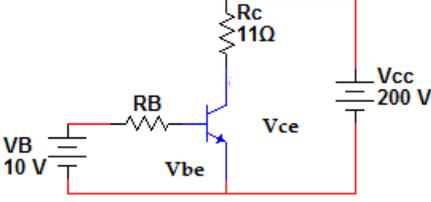MODEL QUESTION PAPER

15EI62

Sixth Semester B.E. Degree Examinations

Power and Industrial Electronics

Time: 3 Hrs

Max. Marks: 80

Note: Answer FIVE FULL Questions, selecting ONE FULL Question from each Module

Question Number		Question	Marks Allotted
		Module -1	
1	a	Discuss the control characteristics of the following power semiconductor devices. i) GTO ii) TRIAC, iii) IGBT,& iv) MOSFET	8
	b	Describe the working of power converter circuits with the input and output waveforms and type of commutation involved.	8
2	a	With waveforms, explain the switching characteristics of Bipolar Junction Transistor (BJT).	5
	b	Briefly, Discuss any two methods used for base drive control in BJT.	7
	c	The bipolar transistor as shown in Figure 2(c) is specified to have β in the range of 8 to 40.The load resistance is $R_L=11\Omega$.The dc supply voltage is Vcc=200V, the input $V_{BE(Sat)}=1.5V$ and $V_B=10V$.find a)The R_B that results in saturation with an ODF of 5 b) The β forced c)The power loss P_T in the transistor. **Figure 2(c)**	4
3	a	Sketch the static characteristics of Silicon Controlled Rectifier and define a) Latching current and b) Holding current.	5
	b	Using two transistor analogy, derive the expression for anode current of Silicon Controlled Rectifier.	5
	c	Discuss the need for protection against di/dt and dv/dt of a thyristor. Explain how it can be fulfilled with the use of an electronic circuit.	6
4	a	Design UJT relaxation oscillator firing circuit for the given parameters, Vs = 20 V, intrinsic standoff ratio, ɳ = 0.66, Ip =10 µA, Vv = 2.5V, & Iv = 10mA.The frequency of oscillations is f =	10

		1Khz.The pulse width is tg = 40 µs. Draw the circuit.	
	b	With a neat circuit and waveform elaborate on the working principle of impulse commutation.	6
		Module -3	
5	a	With necessary circuit and waveforms, elaborate the operation of single phase semiconverter. Assume load current is continuous. Also derive an expression for Vrms and Vaverage output voltages.	7
	b	A single phase half wave controlled rectifier has purely resistive load R and the delay angle is $\alpha = \pi/2$. determine i) The rectification efficiency ii) The form factor iii) The ripple factor.	3
	c	With a neat circuit and waveform explain the working of ON-OFF type AC voltage controller. Obtain an expression for Power factor.	6
6	a	With necessary circuit and waveform explain operation of single phase dual converter.	6
	b	A single phase half wave ac voltage controller has load resistance R=10Ω,input ac supply voltage is 120V,60Hz.The input supply transformer has turns ratio of 1:1.If the thyristor T1 is triggered at α=90°.calculate i)RMS output voltage ii)RMS load current and average load current iii)Input power factor iv)Average and RMS thyristor current.	4
	c	With relevant waveforms, describe the operation of a single phase bidirectional controller with resistive load	6
		Module -4	
7	a	Describe the working of step down chopper with necessary waveforms and equations with R-L Load for both continuous and discontinuous mode of operation.	10
	b	Explain with a neat circuit and necessary waveforms class B and class C choppers.	6
8	a	Discuss the basic characteristics of separately excited DC motor.	5
	b	With the help of circuit diagram describe any two operating modes of DC motor in variable speed applications.	7
	c	With the help of circuit diagram and waveform describe the principle of working of single phase full converter drives.	4
		Module -5	
9	a	Explain with waveforms the operation of 180° mode of three phase Inverters.	10
	b	With a neat circuit and waveform explain current source Inverters	6
10	a	With a neat circuits describe the working of any two methods with respect to Switched mode DC Power Supplies.	8
	b	Explain how Power Electronics is utilized in industrial Electrical welding applications.	8