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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

I Semester B. E. Examinations May-2023

Common to AI / AS/ BT / CH / CS / CY / CD / EE / IM / IS / ME / CV

PRINCIPLES OF ELECTRONICS ENGINEERING (ELECTIVE)

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

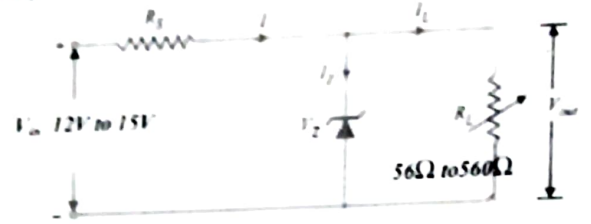
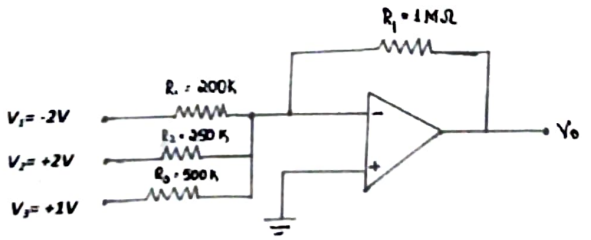
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. Question number 2 is compulsory. Choose any one full question from 3 or 4, 5 or 6, 7 or 8 and 9 or 10.

PART-A

1	1.1	The output voltage of a regulated DC power supply changes from $20V$ to $19.7\,V$ when the load is increased from zero to maximum. Then the load regulation is _____.	02
	1.2	A transistor amplifier connected in CE mode has the value of β as 100 and I_B as $50\mu A$, then the value of I_E and α are _____ and _____ respectively.	02
	1.3	An amplifier has a voltage gain of 100 at $1KHz$. The gain falls by $6dB$ at $1MHz$. If the input is $3mW$ at $2MHz$, then the output voltage is _____.	02
	1.4	In an RC phase shift oscillator using an ideal voltage amplifier, the frequency of oscillation is $2KHz$. If $R = 6.25\Omega$, the value of C is _____.	01
	1.5	A non-inverting amplifier using an op-amp has $R_i = 10K\Omega$ and $R_f = 40K\Omega$. The closed loop gain is _____.	01
	1.6	An operational amplifier has a differential gain of 100 and a common mode gain of 0.01.Then its $CMRR$ is _____ dB.	01
	1.7	The ones's complement of 01011 is _____.	01
	1.8	The decimal equivalent of $(321)_8$ is _____.	01
	1.9	The minimum number of NOR gates required to realize XOR gates is _____.	01
	1.10	For an AM signal, the bandwidth is $10KHz$ and the highest frequency component present is $705KHz$. The carrier frequency used for this AM signal is _____.	02
	1.11	A carrier of peak voltage $15\,V$ is used to transmit a message signal. If the modulation index is 70%, then the peak voltage of the modulating signal is _____.	01
	1.12	The carrier amplitude after AM varies between $4V$ and $1V$. The depth of modulation is _____.	01
	1.13	A $400W$ carrier is modulated to a depth of 75%. Assuming the modulating signal to be sinusoidal, the total power in the amplitude-modulated wave is _____.	01
	1.14	A part of the transducer which responds to a change in the physical phenomenon is called _____.	01

	1.15	The elements which exhibit Piezo-electric qualities are called	01
	1.16	A Hall effect transducer is used to measure a magnetic field of $0.5 wb/m^2$, Bismuth slab of $2mm$ thickness with a Hall coefficient of $1*10^{-6} Vm/(A-wb/m^2)$, and current $3A$ is used. Then the corresponding output voltage is _____.	01

PART-B

2	a	Draw the circuit of a full wave bridge rectifier and describe its working with suitable Waveforms.	06
	b	In a Zener regulator circuit shown in Fig 2b, design the value of R, so that the circuit performs satisfactorily under all given conditions. $I_{zmin} = 5mA, P_{d(max)} = 2.5\,W$ and $Vz = 5.6V$.	
			
		Fig 2b	06
	c	An amplifier having a power gain of $17dB$ delivers a power output of $40W$ to a load of $1K\Omega$. Calculate i) The input power needed ii) The input voltage needed Assume voltage gain of the amplifier is $38dB$.	04
3	a	Draw the circuit of an integrator using an op-amp and derive the expression for the output voltage.	06
	b	Calculate the output voltage of a three-input summing amplifier shown in Fig 3b	
			
		Fig 3b	06
	c	Mention any four advantages of negative feedback.	04
		OR	
4	a	Explain the operation of RC phase shift oscillator with a neat diagram and also mention the gain equation.	06
	b	Design a scaling adder circuit using an op-amp to obtain an output expression. $Vo = -(3V_1+4V_2+5V_3)$ where V_1, V_2, V_3 are the inputs. Assume the value of feedback resistor as $10K\Omega$.	05
	c	Draw the circuit of a differentiator using an op-amp. Derive the expression for the output voltage.	05

5	a	Write the truth table for *SUM* and *CARRYOUT* of a full adder. From the truth table, obtain the logic expressions for the same and then realize the full adder using 2 half adders.	05
	b	Simplify the logic expression and implement the logic circuit using *NOR* Gate. $Y = \overline{(A + \overline{B} + C)(\overline{A} + B + C)(A + B)}$	05
	c	Simplify the logic expression using *K* map and implement the logic circuit using *NAND* Gate. $F(A,B,C,D) = \Sigma m(0,1,3,5,7,8,9,11,13,15)$	06
		OR	
6	a	Simplify the logic expression and implement the logic circuit using *NAND* Gate $Y = (A + \overline{B} + C)(\overline{A} + B + \overline{C})(A + \overline{B})$	06
	b	Simplify the logic expression using *K* map and implement the logic circuit using basic Gates. $F(A,B,C,D) = \Sigma m(0,1,2,5,7,8,9,10,13,15)$	06
	c	Realize the $EX - NOR$ function using a minimum number of *NOR* gates only.	04
7	a	With the help of a neat block diagram explain the working of a Superheterodyne receiver.	06
	b	A carrier of $2MHz$ has $1KW$ of its power amplitude modulated with a sinusoidal signal of $2KHz$. The depth of modulation is 60%. Calculate the sideband frequencies, bandwidth, power in sidebands, total power, and efficiency.	06
	c	Write any four differences between Harvard and Von-Neumann *CPU* architecture.	04
		OR	
8	a	With the help of a block diagram, explain the working of a digital communication system.	06
	b	For an *AM* signal $V_{AM} = 10(1 + 0.5sin6280t)sin(62.8 \times 10^6 t)$. Calculate the sideband frequencies, bandwidth, amplitude of each sideband, Total power, and efficiency.	06
	c	List any four differences between *RISC* and *CISC*.	04
9	a	With the help of a neat diagram, discuss the working principle of *LVDT*.	08
	b	Explain the working principle of ultrasonic sensors and Humidity sensors mentioning their respective applications.	08
		OR	
10	a	Explain the working of a piezo-Electric Transducer with relevant equations.	06
	b	Briefly explain the working of capacitive transducers.	06
	c	Mention any four differences between active and passive transducers.	04