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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

I Semester B. E. Examinations April -2021

Common to All Branches

ELEMENTS OF ELECTRONICS ENGINEERING

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

Instructions to candidates:

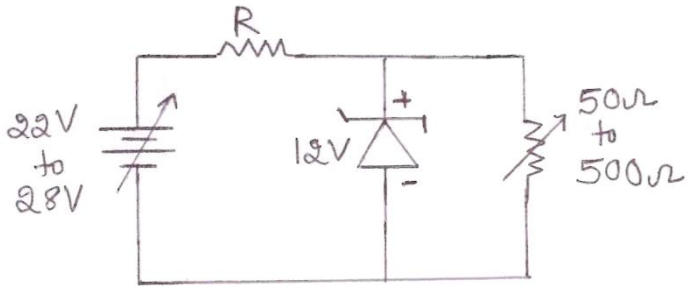
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

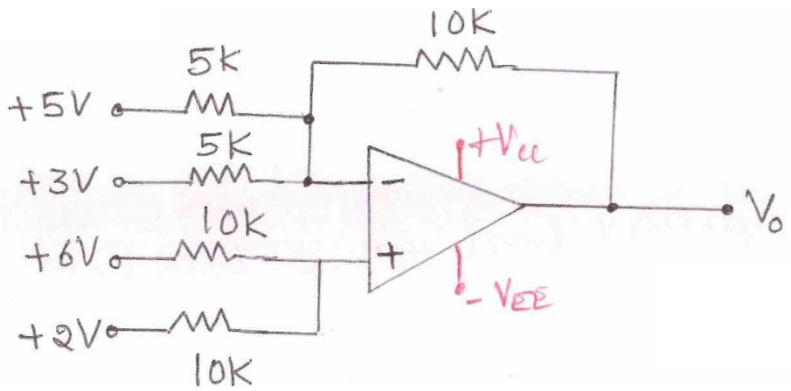
PART-A

1	1.1	The forward voltage drop of a diode at 27^0C is $550mV$, the forward voltage drop at 57^0C is _____.	01
	1.2	The diffusion capacitance of a forward biased diode _____ with decrease in the forward current.	01
	1.3	The full wave bridge rectifier has dc load current $I_{dc} = 100mA$, input ac voltage is $220V, 50Hz$ and $C = 1000\mu F$. The peak to peak ripple voltage is _____.	01
	1.4	A dc power supply has a no load voltage of $30V$ and a full load voltage of $25V$ at a full load current of $1A$. Calculate the load regulation and its output resistance.	02
	1.5	In a voltage divider circuit for a silicon transistor having $\beta = 49$ has $R_E = 4k\Omega$ and $R_{th} = 60k\Omega$, $S_{(I_{CO})} =$ _____.	01
	1.6	A ratio of I_C/I_E is usually less than one and is defined for _____ configuration.	01
	1.7	The output of a cascaded chain of three amplifiers is $8V$, when the input voltage is $2\mu V$. If the voltage gain of first and third stages are $20dB$ and $40dB$ respectively, the voltage gain in the second stage is _____.	02
	1.8	An amplifier without feedback has a gain of 100 and a distortion of 8%. If 3% negative feedback is provided to the amplifier, the distortion is _____ %.	01
	1.9	An $n-$channel $MOSFET$ operating in saturation has $I_D = 4mA$ and $V_{0V} = 2V$. Its trans-conductance (g_m) is _____.	01
	1.10	A $MOSFET$ uses the electric field of a _____ to control the channel current.	01
	1.11	A $1MHz$ sinusoidal carrier is amplitude modulated by a symmetrical wave of period $100\mu sec$. Calculate the upper side band frequency.	01
	1.12	Calculate the total modulation index if an AM signal has modulation indices of 0.3 & 0.4.	01
	1.13	The minimized form of logic expression $\bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + AB\bar{C}$ is _____.	01
	1.14	In a $3-$to-8 decoder, with $X_2X_1X_0$ as the inputs and $Y_0\ to\ Y_7$ as the outputs, what should be the input code so that Y_6 is high and all other outputs are low?	01
	1.15	The total number of gates required to implement $64:1$ multiplexer is _____.	01

	1.16	The minimum number of $NAND$ gates required to realize XOR gates is _____.	01
	1.17	The output signal of an op-amp with a slew rate of $2.5V/\mu sec$ has a peak to peak value of $18V$. Find the maximum frequency of undistorted output signal.	01
	1.18	An op-amp has a differential gain of $86dB$ and common mode gain of $20dB$. The $CMRR$ in dB is _____.	01

PART-B

2	a	List any four specifications of a PN junction diode and indicate their typical values.	04
	b	A full wave bridge rectifier using ideal diodes is supplied from the secondary of a 10:1 transformer whose primary is connected to $220V, 50Hz$ main supply. The output of the rectifier is connected to a load resistance of 220Ω in parallel with a capacitor filter C. Calculate the value of C required so that the ripple factor is 3%. Also determine: i) The dc output voltage ii) The peak to peak voltage iii) The load regulation.	06
	c	In a Zener regulation circuit of Fig 2c, design the value of R, so that circuit performs satisfactorily under all the given conditions. Given $P_{d(max)} = 6W, I_{Zmin} = 10mA, V_Z = 12V$.  Fig 2c	06
3	a	Explain the different operating regions of a transistor along with the applications and draw the output characteristics for transistor in common emitter configuration.	04
	b	In a RC coupled CE amplifier, $R_1 = 120k\Omega$, $R_2 = 40k\Omega$, $R_E = 1.5k\Omega$, $R_C = R_L = 2.7k\Omega$, $V_{CC} = 12V$ and $\beta = 99$. Determine the operating point of a silicon transistor and also calculate the voltage gain.	06
	c	Mention any six advantages of negative feedback. Prove that the stability of the gain of an amplifier with negative feedback is $(1 + A\beta)$ times better compared to that of the amplifier without feedback.	06
		OR	
4	a	Explain the following: i) Thermal runaway ii) Early effect.	04
	b	A voltage amplifier needs $2mV$ input to give a $10V$ output. When negative feedback is provided to this amplifier, it needs $200mV$ to deliver the same output. Determine the open loop gain, closed loop gain, feedback factor and amount of feedback in dB for this amplifier.	06
	c	Explain the working of RC coupled amplifier with the circuit diagram. Draw its frequency response and briefly explain three regions.	06

5	a	Draw the circuit diagram and explain the operation of a two input $CMOS\ NOR$ gate.	04
	b	An $n-$channel $MOSFET$ has $V_t = 0.9V$. If $V_{gs} = V_{ds} = 2.5V$, the drain current I_D is $0.75mA$, i) Find I_D, if $V_{gs} = 4.1V$ and $V_{ds} = 4V$ ii) Find the trans-conductance g_m, if $V_{gs} = 3.4V$ iii) Find r_{ds} for small value of V_{ds} if $V_{gs} = 4.9V$.	06
	c	Draw the block diagram of a communication system and explain the function of each block. List the need for modulation (any four).	06
		OR	
6	a	List eight differences between amplitude modulation and frequency modulation.	04
	b	Explain the operation of a $n-$channel enhancement $MOSFET$ with a suitable diagram along with its output characteristics.	06
	c	An amplitude modulated wave with a modulation index of 50% produces sideband frequencies of $8.824MHz$ and $8.854MHz$. The amplitude of each sideband is $50V$. Determine the amplitude and frequency of both carrier and modulating signals.	06
7	a	Starting from the logic expression, realize $XNOR$ gate using minimum number of $NAND$ gates.	04
	b	Simplify the logic expression using $K-$map and implement the logic circuit using basic gates. $$f(a,b,c,d) = \sum m(0,1,2,3,4,6,8,9,10,11,12,14)$$	06
	c	Explain the operation of a $1-to-4$ demultiplexer and write the logic expressions for its outputs. Also draw the logic circuit to realize the demultiplexer.	06
8	a	Draw the circuit of an integrator using an op-amp. Derive the expression for the output voltage.	04
	b	Draw the circuit and design the values of different resistors of a summer circuit using 2 ideal op-amps to get an output voltage $V_o = V_1 - 2V_2 - 4V_3 + 6V_4 + 8V_5$ where V_1, V_2, V_3, V_4 and V_5 are the available input voltages.	06
	c	Calculate the output voltage V_o for the circuit shown in Fig 8c.  Fig 8c	06