SET VIII

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Name of the Course	:	B.Sc. Prog. _CBCS_DSE
Semester	:	V
Name of the Paper	:	Digital, Analog and Instrumentation
Unique Paper Code	:	42227530
Maximum Marks	:	75

Attempt **four** questions in all.

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Q1 (i) Make a circuit diagram of XNOR gate using NOR gate only.

(ii) Convert $F = A\bar{B} + A\bar{C} + BC$ into the fundamental SOP and POS form.

(iii) Explain full subtractor with proper diagram and truth table.(6 + 6 +6.75)

Q2. (a)   Find the different transistor currents in the circuit as shown in the Fig. below for a silicon transistor with $\beta = 100$ and $I_{co} = 20\ nA$?
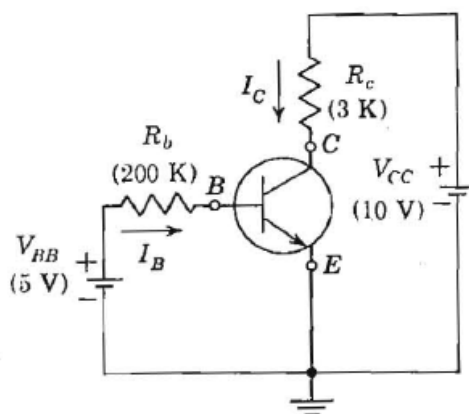

(b) Describe the drift and diffusion currents in semiconductors?

(c) Find the resistivity of (a) intrinsic silicon and (b) p-type silicon with
$N_A = 10^{16}/cm^3$. Use $n_i = 1.5 \times 10^{10}/cm^3$, and assume that for intrinsic silicon $\mu_n = 1350\ cm^2/V.s$ and $\mu_p = 480\ cm^2/V.s$, and for the doped silicon $\mu_n = 1110\ cm^2/V.s$ and $\mu_p = 400\ cm^2/V.s$?

(7 +4 +7.75)

Q3. (a) Derive the expressions for exact closed loop gain and input impedance for an inverting operational amplifier circuit.   (6.75)

(b)   Derive an expression for voltage gain of the circuit below.
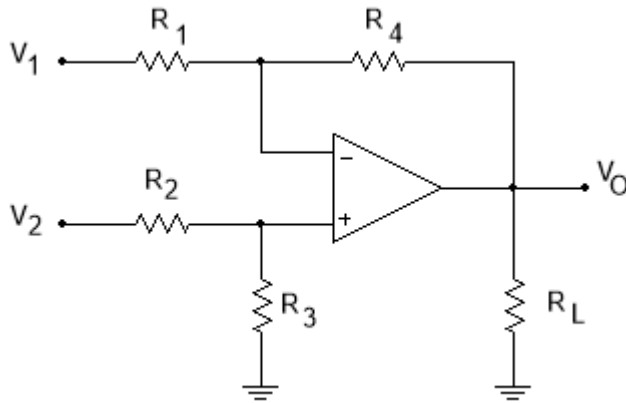
(6)

(c)   Draw the circuit diagram for both an ideal integrator and differentiator. Write the expressions for their output voltage Draw out put waveform in both the cases if the input is a square wave   (6)

Q4. (a) Draw labelled diagram of Cathode Ray Tube and explain the role each part in details. Draw its diagram. The deflection sensitivity of a CRT is 0.01 mm/V. Find the shift produced in the spot when 200 V is applied to the vertical plates.   (12)

(b) For the voltage regulator circuit shown below:
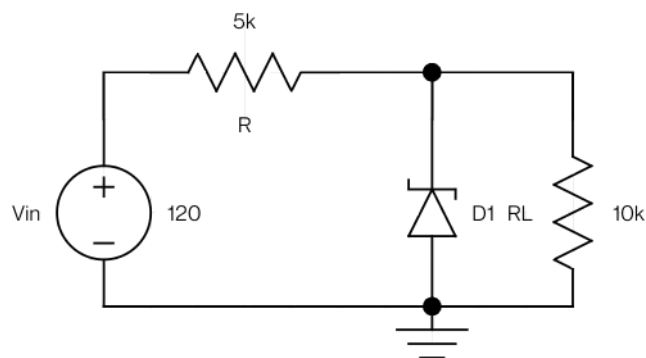
the input voltage is 120 V and voltage across Zener diode is 50 V, calculate:
(a) Voltage and current across R   (b) Output voltage
(c) Load current   (d) Zener current.   (6.75)

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Q5. (a). Minimize $F = \Sigma(0,2,6,7,9,11,14,15)$ using Boolean algebra.

(b) The transistor in the circuit below. has $\beta = 90$ and exhibits a V_{BE} of 0.7 V at $i_C = 1$ mA. Find the values of R_C and R_E so that a current of 1.5 mA flows through the collector and a voltage of +4.5 V appears at the collector? (8 + 10.75)
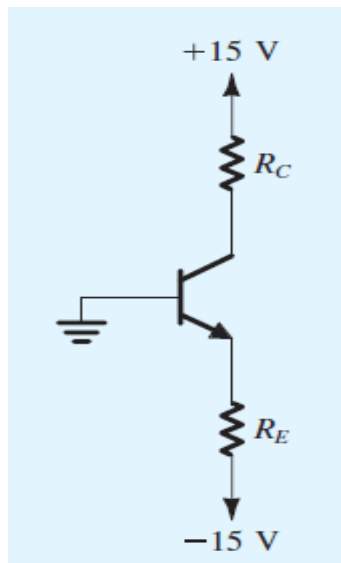
Q6. (a)   Design a circuit for phase shift oscillator using Op-Amp IC741 for a frequency of 1 kHz.   (6)

(b)   Discuss the working of a zero-crossing detector.   (4.75)
(c)   Explain at least four differences between ordinary pn junction diode and Zener diode   along with their applications.   (8)