

Time: Three Hours

MM: 100

Note:

All questions are compulsory.

i) Answer any two sub questions a, b and c from each main question.

ii) Total marks for each main question are twenty.

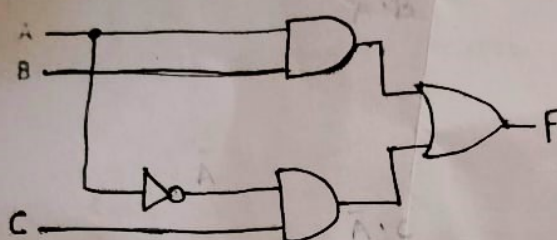
Q1.

(2X10=20 Marks) CO 1

a.

i) Subtract $(53)_8 - (27)_8$ by 2's complement method

ii) Express output F for given circuit in canonical SOP form



b. Reduce the following expression by K-Map $F(A, B, C, D) = \pi(0, 1, 2, 5, 7, 8, 10) + d(11, 13, 15)$
Realize the reduced expression by (i) Basic gates (ii) NOR gates only.

c.

i) If $(23)_x = (21)_y$ and $(21)_x = (16)_y$
Find the values of x and y

ii) Simplify

$$A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}\bar{B}C$$

Q2.

(2X10=20 Marks) CO 2

a. What are the advantages of semiconductors over conductors? With the help of neat diagram explain formation of p type semiconductor by doping.

b. In a germanium sample, an acceptor ^{type} impurity is added to the extent of 1 atom per 10^8 Ge atom. The density of Ge atoms is $4.41 \times 10^{22}/\text{cm}^3$. Find the electron & hole concentration in the doped semiconductor and calculate the conductivity of germanium as well.

Given:

$$\mu_n = 3800 \text{ cm}^2/\text{V-sec}, \mu_p = 1800 \text{ cm}^2/\text{V-sec}, n_i = 2.5 \times 10^{13}/\text{cm}^3$$

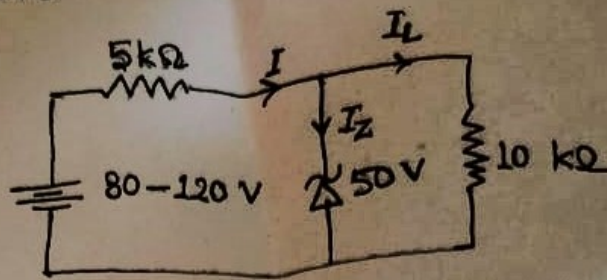
c. What do you mean by built in (or barrier) potential. Explain avalanche breakdown mechanism in p-n junction diode

Q3.

(2X10=20 Marks) CO 3

a. A full-wave rectifier uses two diodes; the internal resistance of each diode may be assumed 30Ω . The transformer r.m.s. secondary voltage from center tap to each end of secondary is 50V and load resistance is 970Ω . Calculate the value of output current and rectifier efficiency.

b. For the circuit shown in Fig. below find the maximum and minimum values of zener diode current.



c. What is the role of capacitor and inductor in a filter circuits? With the help of neat circuit diagram explain working of π (CLC) section filter.

(2X10=20 Marks) CO 4

Q4

a. Draw the common base configuration circuit and explain its current gain, input and output characteristics.
b. Derive relation between dc current gain α , β and γ of a transistor.

In a common base connection, the emitter current is 1 mA . The collector current is $40\text{ }\mu\text{A}$, the emitter circuit is open. Find the total collector current and base current. Given that $\alpha = 0.99$

c. Draw load line, determine Q (operating) Point for the circuit shown. Assume silicon transistor and $\beta = 100$

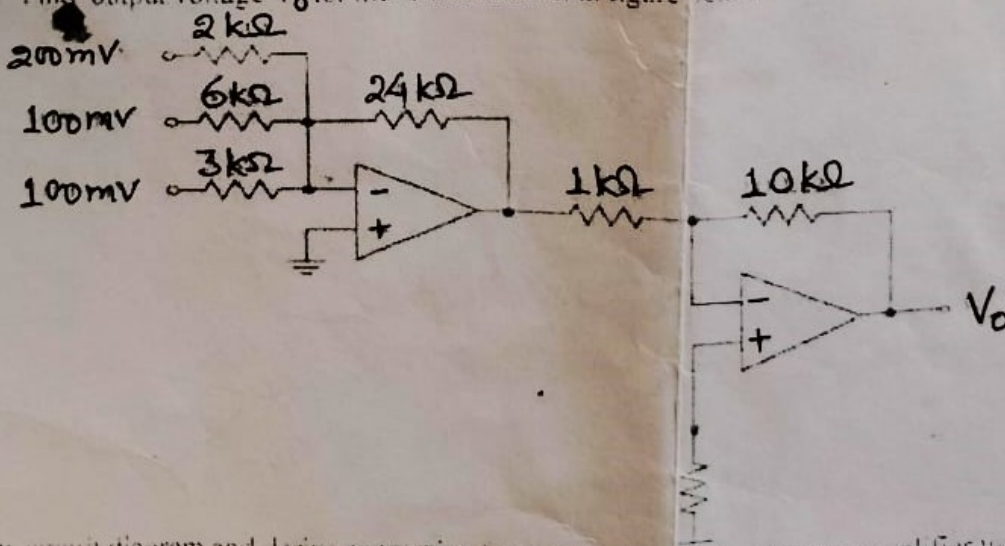


(2X10=20 Marks) CO 5

Q5.

a. Define input offset voltage and input bias current of an OP-AMP (operational amplifier).
List characteristics of an ideal OP-AMP

b. Find output voltage V_o for the circuit shown in figure below



c. Draw circuit diagram and derive expression for output voltage of difference amplifier using OP-AMP