इलेक्ट्रॉनिक्स एवं संचार अभियंत्रिकी विभाग
राष्ट्रीय प्रौद्योगिकी संस्थान
हमीरपुर - १७७००५ (हि.प्र.) भारत

EC-101 Basic Electronics Engineering
### End term Examination
June,2023   [Time Duration: 3 Hour]   Roll No.: ....

Max. Marks   [50 Marks]

Note:Attempt all the questions.

1. Answer the question below in short.   [5 Marks]

   (a) At what temperature semiconductor behaves like insulators and why ?

   (b) An p type semiconductor is electrically positive.Comment on it.

   (c) What is Zener breakdown?

   (d) How MOSFET is a transconductance amplifier?

   (e) BJT is voltage or a current amplifier? justify your answer.

2. Diode is a switch. Explain by showing the working of a pn junction under different biasing conditions. Can we use it as a household switch? Comment on it.   [5 Marks]

3. (a) A sample of germanium is doped to the extent on 10^{14} donor atoms/cm^3 and 7×10^{13} acceptor atom/cm^3. At the temperature of the sample the resistivity of pure (intrinsic) germanium is 60 Ω cm. If the applied electric field is 2V/cm, find the total conduction current density. [2.5 Marks]

   (b) Find the concentration of holes and electrons in p-type silicon at 300^oK if the conductivity is $100(\Omega cm)^{-1}$ [2.5 Marks]

4. The resistor in the circuit shown in figure below has a value of $R = 4k\Omega$, the Zener diode breakdown voltage is $V_z = 5.6V$ and the power rating of the Zener diode is $P = 6.5mW$. Determine the maximum diode current and the maximum power supply voltage that can be applied without damaging the diode.   [5 Marks]
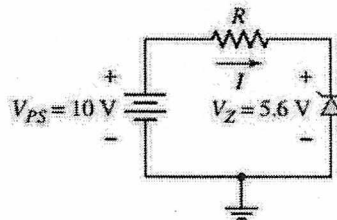

5. Explain with the help of neat diagrams the structure of an n-channel JFET and its volt-ampere characteristics. In what ways it is different from a bipolar junction transistor?   [5 Marks]

6. Mobile phone we are using is a receiver or a transmitter? Explain by showing the block diagram of a communication system with the working of each part.   [5 Marks]

7. Consider the circuit in Figure below, assuming the practical diode model.Assume $V_{on} = 0.3V$ for each diode?   [5 Marks]

   (a) Sketch the output voltage waveform across R_L.

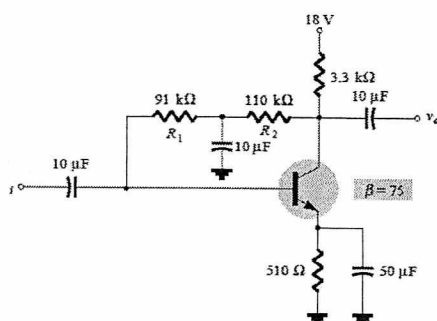   (b) Sketch the output voltage waveform across R_L when diode D1 is burnt in the circuit.
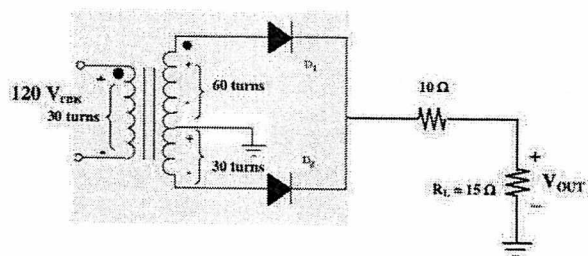
8. In the circuit shown below, V_S is a square wave of period T with a maximum and minimum values of 8V and -10 V respectively. Assume that the diode is ideal and $R1 = R2 = 50\Omega$. Find the average value of V_L voltage?
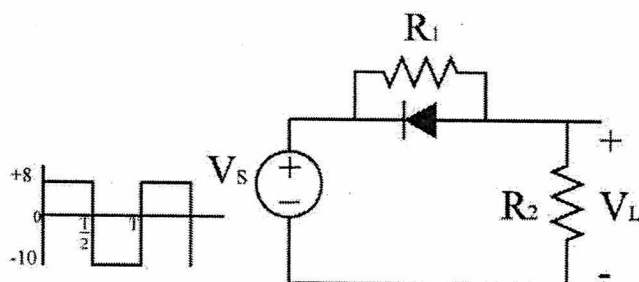
[5 Marks]

9. What is biasing? Which is the best biasing technique? Derive the operating points by showing suitable diagrams. [5 Marks]

10. Determine the dc level of I_B and V_C for the network of Figure given below [5 Marks]

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