Roll No.....

National Institute of Technology, Hamirpur (HP)

Name of Examination: B. Tech Mid-Term Examination (January -2021)

Department: **Electronics & Communication Engineering** Semester: **1st**

Title of the Course: **Basic Electronics Engineering** Course Code: **EC-101**

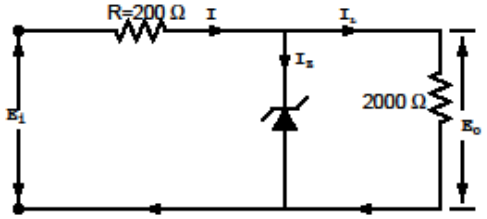
Time: **90 Minutes** Maximum Marks: **30**

Note:

1. **All the questions are compulsory.**
2. **The Marks of each question are indicated against the question.**

Q. 1. Explain Hall's Effect. Derive Continuity Equation for a semiconductor material. **[7 Marks]**

Q. 2. Determine the range of input voltage for the Zener Diode circuit shown below to maintain 30 Volts across the 2000Ω Load. Assuming that series resistance R=200Ω and Zener current rating is 25mA.



[3 Marks]

Q. 3. A Silicon Diode operates at a forward voltage of 0.3Volts. Calculate the factor by which the current will be multiplied, if temperature increases from $27^{o}C$ & $125^{o}C$. **[5 Marks]**

Q. 4. Discuss and draw the V-I characteristics of P-N junction diode under forward and reversed biased condition. **[5 Marks]**

Q. 5. With suitable diagram, discuss the concept of space charge region in detail. **[3 Marks]**

Q. 6 Describe the characteristics of Ideal Diode. Also discuss differences between Ideal and Practical Diodes. **[3 Marks]**

Q. 7 Explain the working principle of Zener Diode and its characteristics in detail. **[4 Marks]**

इलेक्ट्रॉनिक्स एवं संचार अभियंत्रिकी विभाग
राष्ट्रीय प्रौद्योगिकी संस्थान
हमीरपुर - १७१००५ (हि.प्र.) भारत

EC-101 Basic Electronics Engineering

Mid term Examination

Jan 16.2023 [Time Duration: 1.5 Hour] Roll No.: .....

Max. Marks [30 Marks]

Note:Section-A is compulsory.Attempt any six questions from Section-B.

Section-A(Compulsory)

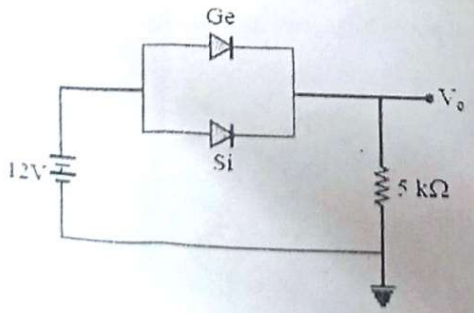
1. Answer the question below in short. [6 Marks]
   (a) Is the temperature coefficient of resistance of a semiconductor is positive or negative?Explain.
   (b) Why the mobility of holes is smaller than the electrons in Si Semiconductors?
   (c) An n-type semiconductor is electrically negative.Comment on it.
   (d) Why an ordinary diode suffers avalanche breakdown rather than zener breakdown?
   (e) For a reverse bias pn junction diode,does the transition region increase or decrease in width?
   (f) Peak inverse voltage(PIV) of a rectifier is required to be high or low?

Section-B(Attempt any six questions)

2. The intrinsic resistivity of a germanium semiconductor at 300K is 0.47 ohm-m.The electron mobility at 300K in Ge is 0.39 $m^2/V-s$.The hole mobility at 300K in Ge is 0.19 $m^2/V-s$.Calculate the density of electrons in the intrinsic material.Also calculate the drift velocity of holes and electrons for an electric field$(E) = 10^4 V/m$. [4 Marks]

3. Discuss the Energy Band structure of an open circuit p-n junction and analyse quantitatively the same for its current components. [4 Marks]

4. In the circuit below Ge and Si Diodes are used in parallel.Si and Ge diode conducts at 0.7V and 0.3V respectively.
   (a) Find the value of V_o in the figure below.
   (b) In the following figure if Ge diode is reversed then how much is the change in the value of V_o?



[4 Marks]

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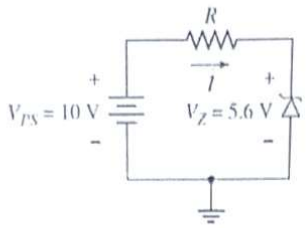
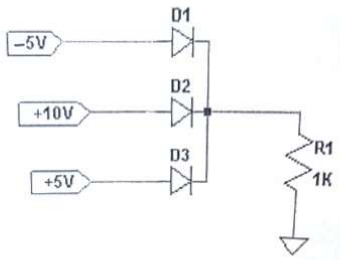
5. The resistor in the circuit shown in figure below has a value of $R = 4k\Omega$,the Zener diode breakdown voltage is $V_z = 5.6V$ and the power rating of the zener diode is $P = 6.5mW$.Determine the maximum diode current and the maximum power supply voltage that can be applied without damaging the diode. 0.25cm [4 Marks]



6. Assuming diode to be ideal,what is the voltage across the resistance R1 having value 1K as shown in the figure? [4 Marks]



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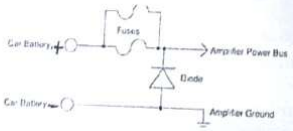
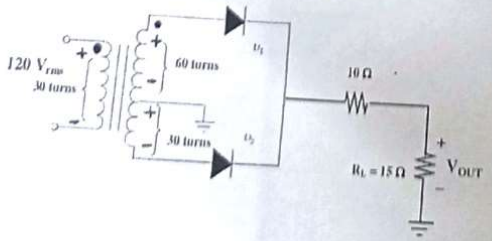
7. The practical circuit of a car battery connected with the amplifier(stereo system) is shown in the figure below.What is the purpose of the diode used in the circuit.(Recall pn junction V-I Characteristics) [4 Marks]



8. Consider the circuit in Figure below, assuming the practical diode model.Assume $V_{on} = 0.7V$for each diode? [4 Marks] (5Mai

(a) Sketch the output voltage waveform across R_L.

(b) Sketch the output voltage waveform across R_L when diode D2 is burnt in the circuit.



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