PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023

Semester : Semester II - 2022   **Date :** 18-APR-2023
Course Code : ECE2001   **Time :** 2PM - 3.30PM
Course Name : Sem II - ECE2001 - Analog Electronics   **Max Marks :** 50
Program : ECE   **Weightage :** 25%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

### ANSWER ALL THE QUESTIONS   (5 X 2 = 10M)

1. The process of adding impurity to an intrinsic semiconductor is termed as doping and the added impurity is called as the dopant. What are these pentavalent impurities called and why?

(CO1) [Knowledge]

2. In order to "turn on" and conduct current in the forward direction, a diode requires a certain amount of positive voltage to be applied across it. What is this voltage called? What is the voltage drop across a silicon diode when it is in "ON" condition?

(CO1) [Knowledge]

3. Identify the electrical circuit that converts the complete cycle of alternating current into pulsating DC with a smaller ripple factor and higher peak inverse voltage. What is the ripple factor of the above circuit?

(CO1) [Knowledge]

4. A PN junction even in the forward bias condition does not conduct current untill a certain amount of potential is applied across its terminals. What is this potential called and why. Justify.

(CO1) [Knowledge]

5. I am a heavily doped semiconductor device designed to operate in the reverse breakdown region. I also help in protecting the electrical appliance from the fluctuation of voltage. Identify the device.

(CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS   **(2 X 10 = 20M)**

6. A voltage regulator converts an unregulated dc voltage into a constant regulated dc voltage A voltage regulator is a system designed to automatically maintain a constant voltage. For the circuit shown in Fig.1 (i), find (i) the output voltage (ii) the voltage drop across series resistance (iii) the current through zener diode.
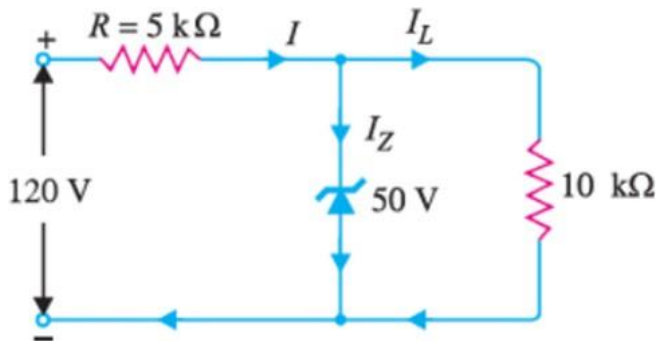
(CO1) [Comprehension]

7. A current-controlled bipolar junction transistor is a three-terminal semiconductor device that consists of two p-n junctions which can amplify or magnify a signal. Illustrate the working of the NPN transistor with its input and output characteristics when the emitter is common to input and output terminals. Derive the expression of current gain for CB, CE, and CC configurations of the transistor.

(CO2) [Comprehension]

PART C

**ANSWER ALL THE QUESTIONS**   **(2 X 10 = 20M)**

8. a. In the analog electronics lab, we have a circuit that converts an AC signal to DC by passing either the negative or positive half-cycle of the waveform and blocking the other. This circuit uses a transformer with a turns ratio of 2:1. The load resistance is 500Ω. If the primary voltage is 240V, 50 Hz, calculate
(i)   The peak inverse voltage
(ii)   The dc output voltage
Neglect cut-in voltage and forward resistance of the diode in the circuit.[5Marks]
b. For the double-ended clipper circuit shown below, find the output of the circuit, for a sinusoidal input
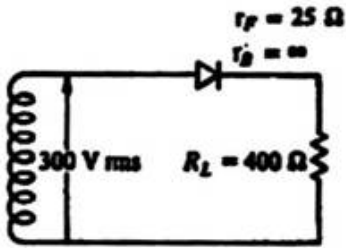Vi (t) = Vm sin (2πt/T) where (VB1, VB2) < Vm and draw the VTC diagram.[5Marks]
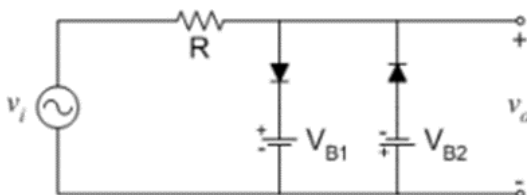
(CO1) [Application]

9. a. The circuit consists of a diode, a resistor, and a capacitor that shifts the waveform to a desired DC level without changing the actual appearance of the applied signal. For the circuit shown draw the output voltage waveform for the input as shown in the figure with a clearly explaining of the working of the circuit.[5 Marks]

0.1 μF

R 100K

Fig. 1

f = 1000 Hz

5V

0

-10V

Fig. 2
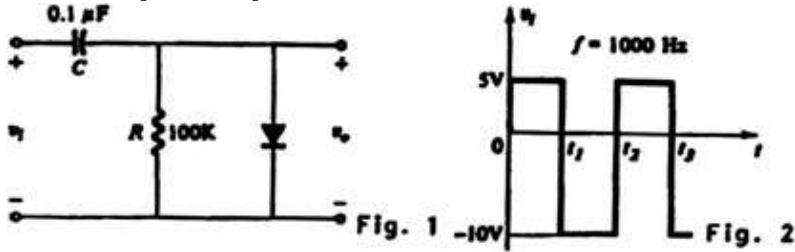
b. The circuit converts an AC signal to DC by passing either the negative or positive half-cycle of the waveform and blocking the other. Identify the circuit shown in the figure, determine (a)Idc, (b) Irms, (c) the ripple factor r, (d) the rectifier efficiency ηr, (e) the peak inverse voltage PIV.

$r_f = 25\ \Omega$

$r_b = \infty$

300 V rms $R_L = 400\ \Omega$

(CO1) [Application]