

- * Waveform Plotting $\rightarrow 4m$
- * Mesh analysis $\rightarrow 5m$
- * Thevenin's theorem $\rightarrow 5m$
- * Normal DC circuit $\rightarrow 4m$
- * Diodes $\rightarrow 4m$
- * High pass or Low pass $\rightarrow 5m$
- * Op-Amp $\rightarrow 8m$

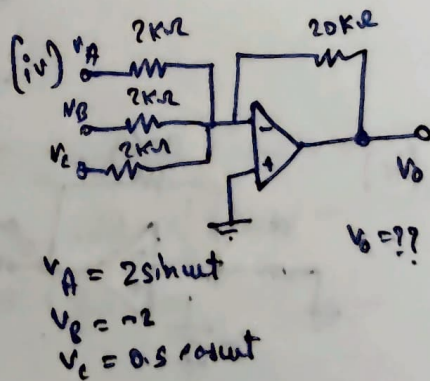
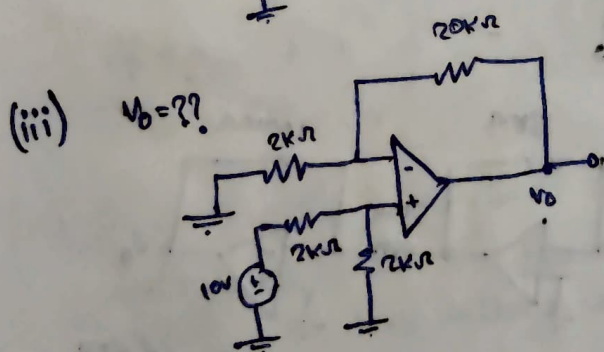
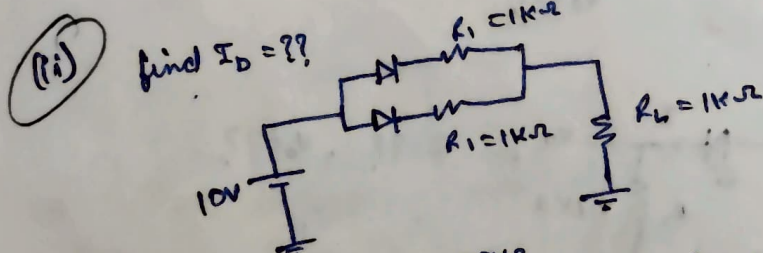
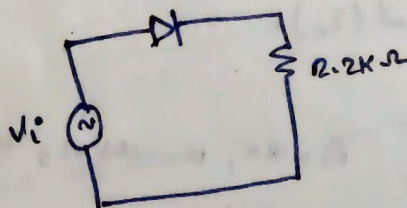
Module 1:- 14m

Module 2:- 4m + 4m + 5m $\rightarrow 13m$

Module 3:- 8m

Imp Question :-

- (i) Assume a sinusoidal waveform with an amplitude of 5V and 60Hz is applied to the circuit shown in Fig. 1. Draw the output waveform across the resistor and diode by assuming the diode is made of silicon and cut-in voltage 0.7V.



Tutorial Sheet - 4

2023 - End Sem Paper - 2

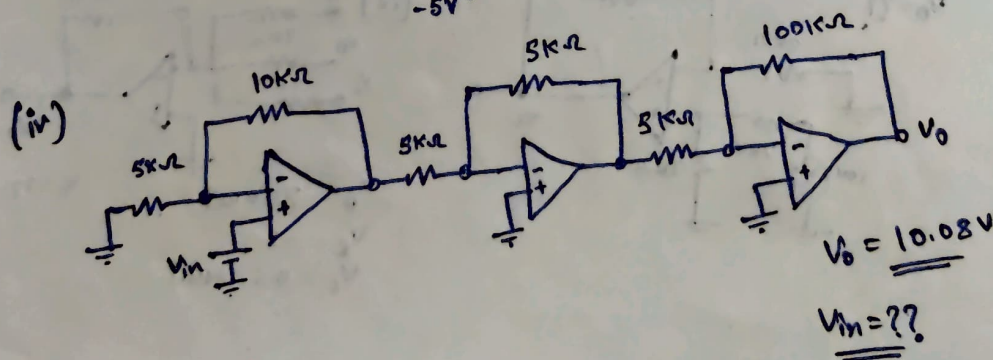
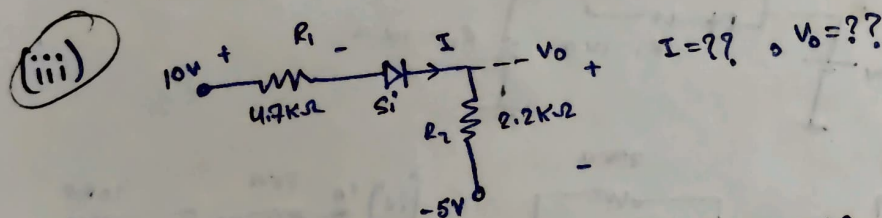
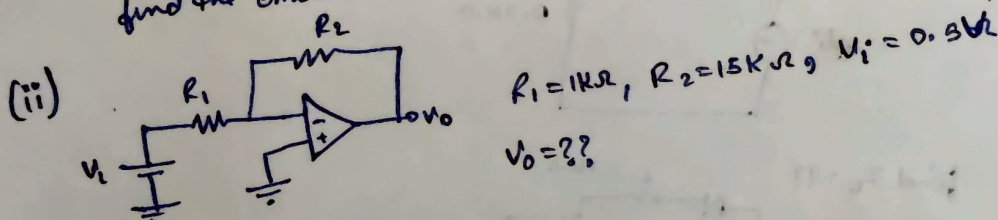
Vishnu Kumar Chitkala

- * BST $\rightarrow 2m$
- * Op-Amp $\rightarrow 2m + 5m$
- * DC Circuit $\rightarrow 3m$
- * Nodal analysis $\rightarrow 4m$
- * Diode $\rightarrow 4m$
- * Norton's theorem $\rightarrow 5m$
- * High pass or Low pass $\rightarrow 5m$
- * Zener diodes $\rightarrow 5m$

Module 1 :- 12m
Module 2 :- 14m
Module 3 :- 9m

Imp Question :-

- (i) In a common emitter connection of a transistor, the base-current amplification factor (β) is 50. if the base current (I_B) is $20\mu A$. find the emitter current (I_E).

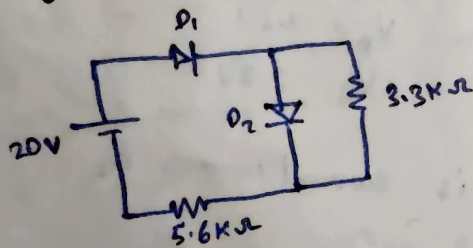


- * Mesh analysis $\Rightarrow 5m$
- * Norton's theorem $\Rightarrow 5m$
- * Bridge $\Rightarrow 5m$
- * waveform $\Rightarrow 5m$
- * Zener diode $\Rightarrow 5m$
- * High pass, low pass $\Rightarrow 5m$

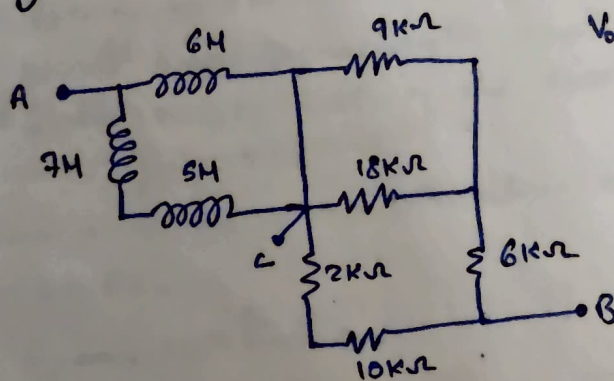
Module 1 :- 10m
Module 2 :- 20m

Imp Question :-

- (i) For the circuit given, determine I_1 , I_2 , I_3 . The diodes are made of silicon with cut-in $0.7V$.

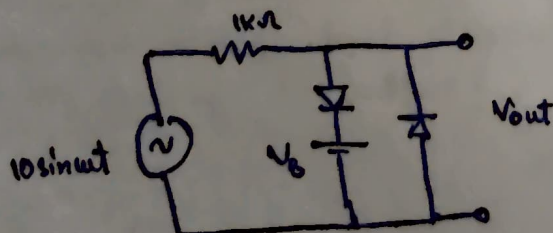


- (ii) High pass or low pass, find cut-off frequency.



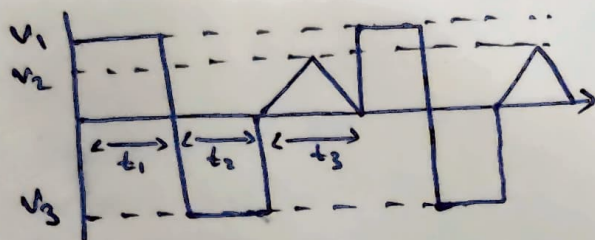
V_{out} is across C & B.

- (iii) Draw the output waveform with equivalent circuits in positive and negative halves. The diodes are made of silicon and cut-in is $0.7V$. The bias voltage is $5V$. (V_B)



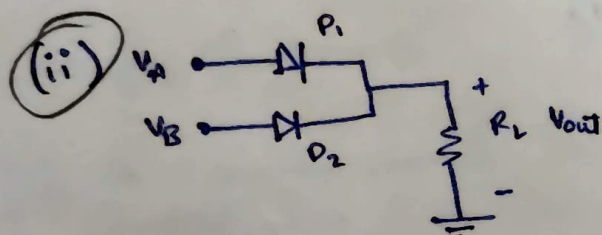
Imp Questions :-

(i)



$$\begin{aligned} V_1 &= 12V \\ V_2 &= 4V \\ V_3 &= 5V \\ t_1 &= 6s \\ t_2 &= 3s \\ t_3 &= 6s \end{aligned}$$

$V_{avg} = ??, V_{peak} = ??$



$$\begin{aligned} R_L &= 1240\Omega \\ V_A &= 9.6V \\ V_B &= 7.7V \end{aligned}$$

what is current across R_L

- * Zener diode $\Rightarrow 8m + 2m$
- * Thevenin's theorem $\Rightarrow 3m$
- * Node analysis $\Rightarrow 3m$
- * Mesh analysis $\Rightarrow 4m$
- * Diode $\Rightarrow 1m + 3m + 2m$
- * RLC circuit $\Rightarrow 3m$

Module 1:- 10m

Module 2:- $5m + 6m + 3m \Rightarrow 14m$

Imp Questions:-

- (i) Consider a silicon which is doped with $4 \times 10^{16} \text{ cm}^{-3}$ phosphorus atoms and kept at room temperature. The minority carrier type is — and concentration (in cm^{-3}) is —.

$$n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$$

$$\Rightarrow n p = (n_i)^2 \Rightarrow p = \frac{(n_i)^2}{n} \Rightarrow p = \frac{1.5 \times 1.5 \times 10^{20}}{4 \times 10^{16}} \Rightarrow \underline{\underline{0.56 \times 10^4 \text{ cm}^{-3}}}$$

- (ii) The voltage across diode is 0.6 volt at point A as shown in the below diode characteristic curve. The dynamic resistance (r_d) and static resistance (r_s) of the diode at point A are — and —, respectively.

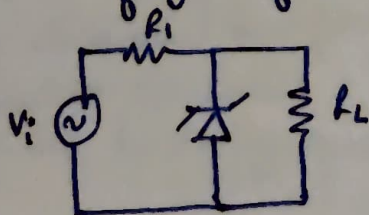
Given that the reverse saturation current is $72 \times 10^{-12} \text{ A}$, $\eta = 1$.

$$V_T = 0.026 \text{ V}$$

$$\Rightarrow \text{dynamic resistance} = \frac{V_T}{I_d}$$

$$\text{Static resistance} = \frac{V_d}{I_d}$$

- (iii) An input signal $V_i = 14.7 \sin(\omega t)$ is applied to the circuit shown below. The silicon Zener diode has zener breakdown of 4.5V. When the output is observed across R_L in an oscilloscope. What is the maximum voltage level observed in the positive and negative half cycle of the output?



Repeated