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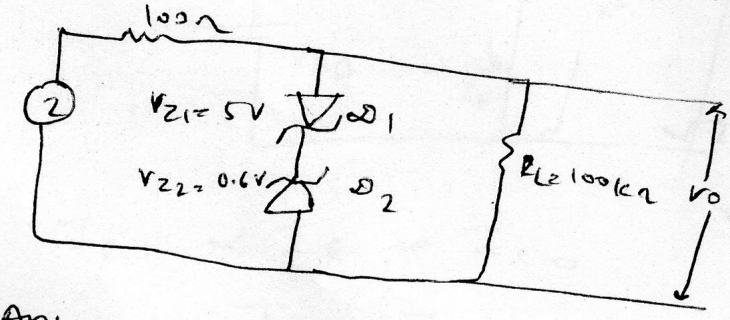
MODEL TEST PAPER

SUB ELECTRONIC DEVICES & CIRCUITS

III rd sem, ECE Branch

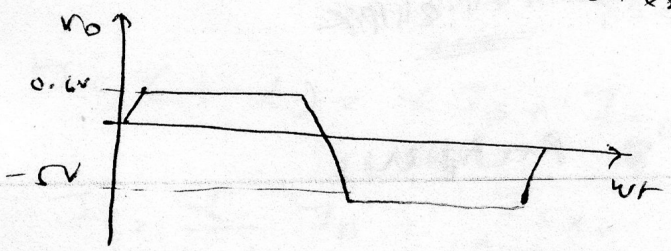
Duration :- 1 Hr.

Q.1 Draw the Output Voltage Waveform of the circuit given below:- $V_i = 10 \sin \omega t$




Ans:- $v_{oz} \frac{10 \sin \omega t}{100.1k} \times 100k$, $v_i \geq 0.6V$ $D_2$ behaves as 0.6 battery in +ve half cycle ⇒ $D_1$ is short $D_2$ acts.

In -ve half cycle $v_i < 5V$ $v_i = v_o$ i.e output follows input if $v_i > 5V$ behaves 5V battery $v_o = -5V$




OR Compare BJT with FET ? (Three difference)!

Ans.

| BJT | FET |
|---|---|
| (1) 3 terminals in BJT (Emitter, base, collector) | 3 terminal (Source, gate, drain) |
| (2) BJT is Current Controlled device. | Voltage Controlled device |
| (3) Input Impedance is is lower. | Input Impedance is very high |

# MODEL TEST PAPER

**Q3.** Transition Capacitance of an abrupt junction diode is 20pF at 5V. Compute the decrease in capacitence for 1V increase in bias.

**Ans** In $C_T = \epsilon A / t$, $t \propto V^{1/2}$

$C_T \propto V^{-1/2}$

So $C_{T_1} = 20pF$, $V_1 = 5V$

$C_{T_2} = ?$ $V_2 = 6V$

$$\frac{C_{T_2}}{C_{T_1}} = \left(\frac{V_1}{V_2}\right)^{1/2}$$

$$C_{T_2} = C_{T_1}\left(\frac{V_1}{V_2}\right)^{1/2} = 20\times10^{-12}\times\left(\frac{5}{6}\right)^{1/2} = 18.25\,pF$$

Decrease in capacitance $= 20 - 18.75 = 1.25\,pF$

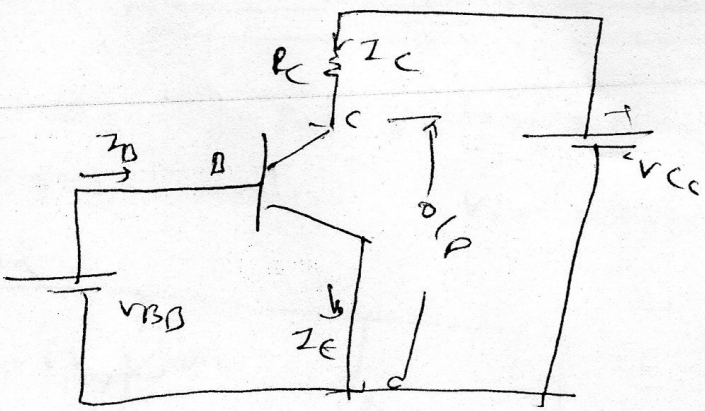
**Q4.** Compare different type of Rectifiers.

**Ans**

| S.N | Particular | Half wave | Centre tap | Bridge |
|---|---|---|---|---|
| 1 | No. of diods | one | Two | four |
| 2 | maximum $\eta$ | 40.6% | 81.2% | 81.2% |
| 3 | P.I.V. | $V_m$ | $2V_m$ | $V_m$ |
| 4. | Ripple factor | 1.21 | 0.48 | 0.48 |

Draw the circuit diagram of CE stage of BJT & find the Relation Between $\alpha$ and $\beta$.

Ans




$$I_C = \alpha I_E + I_{CO}$$

$$I_{CO} = I_{CBO}$$

$$I_C = \alpha I_E + I_{CBO}$$

$$I_E = I_B + I_C$$

$$I_C = \alpha(I_B + I_C) + I_{CBO}$$

$$I_C(1-\alpha) = \alpha I_B + I_{CBO}$$

$$I_C = \frac{\alpha}{1-\alpha} I_B + \frac{I_{CBO}}{1-\alpha}$$

$$\boxed{I_C = \beta I_B + I_{CEO}}$$

Relation

$$\beta = \frac{\Delta I_C}{\Delta I_B}, \quad \alpha = \frac{\Delta I_C}{\Delta I_E}$$

$$\beta = \frac{\Delta I_C}{\Delta I_E - \Delta I_C} = \frac{\frac{\Delta I_C}{\Delta I_E}}{1 - \frac{\Delta I_C}{\Delta I_E}} = \frac{\alpha}{1-\alpha}$$

$$\beta = \frac{\alpha}{1-\alpha}$$

$$\beta - \beta\alpha = \alpha$$

$$\beta = \beta\alpha + \alpha$$

$$\beta = \alpha(1+\beta)$$

$$\boxed{\alpha = \frac{\beta}{1+\beta}}$$

$$\boxed{\beta = \frac{\alpha}{1-\alpha}}$$

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