

B.E - Formula list :-1. Half wave Rectifier :-

i) Average dc load current - $I_{DC} = \frac{I_m}{\pi}$

ii) Average dc load voltage - $V_{DC} = \frac{V_m}{\pi}$

iii) RMS value of load current - $I_{RMS} = \frac{I_m}{\sqrt{2}}$

iv) RMS value of load voltage $V_{RMS} = \frac{V_m}{\sqrt{2}}$

v) Ripple factor, $\gamma = 1.21$

vi) Rectifier efficiency $= \eta = 40.5\%$

2. Full Wave Bridge Rectifier :-

i) $I_{DC} = 2I_m / \pi$

ii) $V_{DC} = 2V_m / \pi$

iii) $I_{RMS} = I_m / \sqrt{2}$

iv) $V_{RMS} = V_m / \sqrt{2}$

v) Ripple factor, $\gamma = 0.482$

vi) Rectifier efficiency $= \eta = 81.13\%$

3. Bridge rectifier with Filter :-

Ripple Factor $= \gamma = \frac{1}{4\sqrt{3} f C R_L}$

4. Zener Diode :-

• With Load, $I_z = \frac{V - V_z}{R}$

• Without Load, $I_z = \frac{V - V_z}{R}$
where $I = I_z + I_L$

6. Transistor :- $\rightarrow I_E = I_B + I_C$

i) Common Base current gain, $\alpha = \frac{I_C}{I_E}$

ii) Common Emitter current gain, $\beta = \frac{I_C}{I_B}$

6. Relation between α and β

$$\bullet \quad \beta = \frac{I_C}{I_B} = \frac{\alpha}{1 - \alpha}$$

$$\bullet \quad \alpha = \frac{I_C}{I_E} = \frac{\beta}{1 + \beta}$$

7. Dynamic Resistance

• Input $= r_i = \frac{\Delta V_{BE}}{\Delta I_B}$ where V_{CE} is constant

• Output $= r_o = \frac{\Delta V_{CE}}{\Delta I_C}$ where I_B is constant

8. Single stage R-C coupled CE amplifier :-

$$\bullet \quad V_{CC} = I_C R_C + V_{CE}$$

9. MOSFET :-

$$\bullet \quad K = \frac{I_D(\text{ON})}{(V_{GS} - V_T)^2}$$

10. Frequently used Formulas :-

HWR \rightarrow • Peak current $- I_m = \frac{V_m}{R_f + R_s + R_L}$

• DC Output Power, $P_{DC} = I_{DC}^2 R_L$

• AC Output Power, $P_{AC} = I_{RMS}^2 (R_f + R_s + R_L)$

• DC ^{load} voltage, $V_{DC} = \frac{V_m / \pi}{R_L} \cdot \frac{R_L}{R_f + R_s + R_L} = \frac{V_m / \pi}{1 + \frac{R_f + R_s}{R_L}}$

• RMS load voltage $V_{RMS} = \frac{V_m / 2}{1 + \frac{R_f}{R_L}}$

• Rectification efficiency $\eta = \frac{P_{DC}}{P_{AC}}$

• $I_{DC} = \frac{V_{DC}}{R_L}$

\rightarrow • Peak voltage $- V_m = V_{RMS} \times \sqrt{2}$

\rightarrow Full wave bridge Rectifier :-

• $I_m = \frac{V_m}{2R_f + R_s + R_L}$ For ideal diode $= R_f = 0$
 $I_m = \frac{V_m}{R_L}$

\rightarrow Zener Diode :-

• $P_Z = I_Z V_Z$

• When no load $- I_s = I_Z(\text{max}) + I_L$

$- R_s = \frac{V_{in} - V_Z}{I_Z(\text{max})}$

$- I_L = \frac{V_L}{R_L}$

- When there is load, $I_{Z(\min)} = I_S - I_L$
- Zener regulator circuit, $R_S = \frac{V_{in} - V_Z}{I_Z}$
where $I_S = I_Z + I_L$

→ Transistor :-

- $I_B = \frac{V_{BB} - V_{BE}}{R_B}$, I_B = Base current

- $V_{CE} = V_{CC} - I_C R_C$

- $V_{EC} = V_{CE} + V_{BE}$

→ • Minimum load resistance - $R_{L\min} = \frac{V_L}{I_{L\min}}$

• Maximum load resistance - $R_{L\max} = \frac{V_Z}{I_{L\min}}$

- $I_S = I_{Z(\max)} + I_{L(\min)}$

- $I_{L(\min)} = I_S - I_{Z(\max)}$
- $I_S = \frac{V_{in} - V_Z}{R_S}$

Zener Regulator

→ • $I_{Z(\max)} = \frac{P_Z}{V_Z}$

- $I_{L(\min)} = \frac{V_Z}{R_L}$

Zener diode

- $R_S = \frac{V_{in} - V_Z}{I_S}$

- $I_S = I_Z - I_L$

→ Signal voltage gain of an amplifier = $A_v = \frac{V_{out}}{V_{in}}$