Sr. No.	Parameter	HWR	FWR	Bridge rectifier
12.	Transformer core saturation	Possible	Not possible	Not possible
13.	PIV	V_m	$2\,V_m$	V_m
14.	Expression for the peak load current	$I_m = \frac{V_m}{(R_S + R_F + R_L)}$	$I_m = \frac{V_m}{(R_S + R_F + R_L)}$	$I_m = \frac{V_m}{(R_S + 2R_F + R_L)}$
15.	Circuit diagram	Refer Fig. A	Refer Fig. B	Refer Fig. C

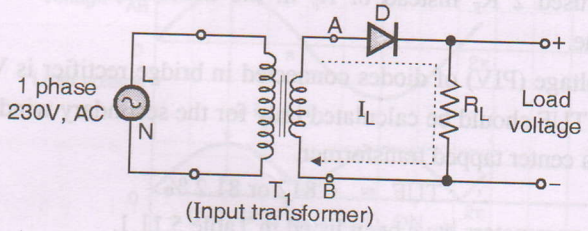

Fig. A : HWR

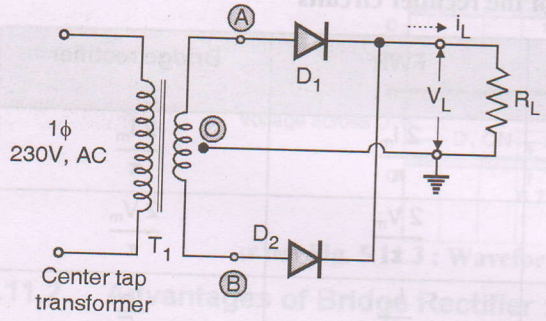

Fig. B : FWR

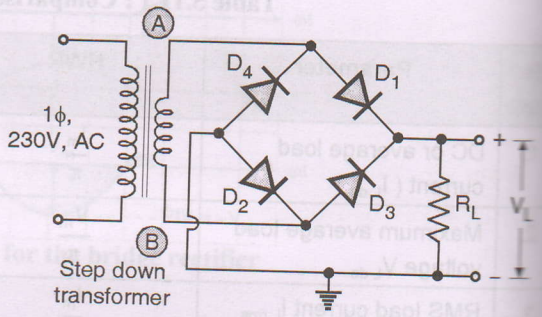

Fig. C : Bridge

5.11.6 Examples on Bridge Rectifier :

Ex. 5.11.1 : A bridge rectifier circuit has secondary voltage of 12 V_{rms}. Assume secondary resistance and diode forward resistance to be negligible. Load resistance is 100 Ω. Calculate peak load current, DC load current, rms load current and PIV across each diode.

Soln. : **Given :** $V_{S\,rms} = 12$ V, $R_S = 0\,\Omega$, $R_F = 0\,\Omega$, $R_L = 100\,\Omega$.

1. Peak load current, $I_m = \frac{V_m}{(R_S + 2R_F + R_L)} = \frac{\sqrt{2}\,V_{S\,rms}}{R_L}$

$$\therefore I_m = \frac{\sqrt{2} \times 12}{100} = 0.169 \text{ Amp} \quad \text{...Ans.}$$

2. D.C. load current, $I_{L\,dc} = \frac{2\,I_m}{\pi} = \frac{2 \times 0.169}{\pi} = 0.108$ Amp ...Ans.

3. RMS load current, $I_{L\,rms} = \frac{I_m}{\sqrt{2}} = \frac{0.169}{\sqrt{2}} = 0.118$ Amp ...Ans.

4. PIV across each diode, PIV $= V_m = \sqrt{2} \times 12 = 16.97$ V ...Ans.

Ex. 5.11.2 : A bridge rectifier is applied with input from a step down transformer having turns ratio 8:1 and input 230 V, 50 Hz. If the diode forward resistance is 1 Ω, secondary resistance is 10 Ω and load resistance connected is 2 kΩ find :

1. DC power output
2. PIV across each diode
3. % efficiency
4. % regulation at full load

Refer CD for Solution

Ex. 5.11.3 : Determine the rms value of secondary voltage of a transformer which provides 9 V dc output voltage when connected to a bridge rectifier. If the secondary winding resistance is 3 Ω and diode forward resistance is 1 Ω what will be the output voltage when 90 Ω load is connected to the power supply ?

Refer CD for Solution

Ex. 5.11.4 : A full wave bridge rectifier is supplied from 230 V, 50 Hz and uses a transformer of turns ratio of 15 : 1. It uses load resistance of 50 Ω. Calculate load voltage and ripple voltage. Assume ideal diode and transformer. Assume standard value of ripple factor for full wave rectifier.

Refer CD for Solution

Ex. 5.11.5 : A 5 kΩ load is fed from a bridge rectifier connected with a transformer secondary whose primary is connected to 460V, 50 Hz supply. The ratio of number of primary to secondary turns is 2 : 1. Calculate dc load current, dc load voltage, ripple voltage and PIV rating of diode.

Dec. 10, 4 Marks.

Soln. :

Given : $N_p : N_s = 2 : 1$, $R_L = 5$ kΩ, Assume R_S and $R_F = 0$

1. **Rms secondary voltage** $V_{srms} = \frac{N_s}{N_p} \times 460 = \frac{1}{2} \times 460 = 230$ V. ...(1)

2. **Peak secondary voltage** $V_m = \sqrt{2} \times V_{srms} = \sqrt{2} \times 230 = 325.26$ ...(2)

3. **Peak load current** $I_m = \frac{V_m}{R_S + 2R_F + R_L} = \frac{325.26}{5000} = 0.065$ A. ...(3)

4. **DC load current** $I_{Ldc} = \frac{2I_m}{\pi} = \frac{2 \times 0.065}{\pi} = 0.041$ ...Ans.

5. **DC load voltage** $V_{Ldc} = I_{Ldc} \times R_L = 0.041 \times 5000 = 205$ V. ...Ans.

6. **Ripple voltage** = Ripple factor × V_{Ldc}

The standard value of ripple factor is 0.482 for the bridge rectifier.

∴ Ripple voltage $= 0.482 \times 205 = 98.81$ V ...Ans.

7. PIV rating of diode PIV $= V_m = 325.26$ V ...Ans.