JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY
Electronics and Communication Engineering
Electrical Science-2 (15B11EC211)
Tutorial Sheet: 10

Q1[CO3]. The turns ratio of a transformer used in a half-wave rectifier circuit is $N_1 : N_2 = 12 : 1$. The primary is connected to the power mains (220 V, 50 Hz). Assuming the diode resistance in forward bias to be zero, calculate the dc voltage across the load. Also determine the PIV of the diode. [**Ans**. 8.25 V, 25.93 V]

Q2[CO3]. A half-wave rectifier circuit uses a silicon diode with $r_f = 10\ \Omega$ and $V_T = 0.7$ V. The load connected at the output is $R_L = 500\ \Omega$. The transformer has $N_1/N_2 = 10/1$. If the primary is connected to the ac mains supply (220 V, 50 Hz), calculate

(a)) the dc current through the load,
(b)) the rectification efficiency, and
(c) the PIV rating of the diode.

[**Ans**. (*a*) 19.4 mA; (*b*) 39.8 %; (*c*) 30.4 V]

Q3[CO3]. For the centre-tap rectifier circuit shown in Fig. 1, find

(a) PIV rating of the diodes,
(b)) the maximum dc voltage that can be obtained, and
(c)) the reading of the milliammeter.

[**Ans**. (*a*) 31 V; (*b*) 9.9 V; (*c*) 9.9 mA]

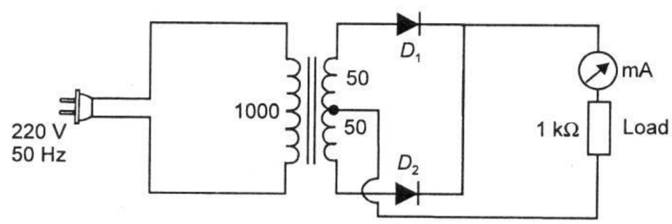

Fig. 1

Q4[CO3]. The primary winding of the step-down transformer of a bridge rectifier is connected to ac mains (220 V, 50 Hz). It uses silicon diodes, with $V_T = 0.7$ V. If it is desired to obtain a maximum dc voltage of 15 V from this circuit, find the turns ratio of the transformer.

[**Ans**. 12 : 1]

Q5[CO3]. The diodes used in a bridge rectifier circuit have the following parameters:

$V_T = 0$ V, $r_f = 10\Omega$, $R_R = \infty$, V_Z = very large

The secondary winding of the transformer has a resistance $R_S = 10\ \Omega$. A load of 970 Ω is connected across its output. If the voltage across the secondary is $v_s = 20 \sin \omega t$ volts, determine

(a) *PIV* rating of the diodes,
(b)) dc current through the load,
(c)) dc power supplied to the load, and

(d) conversion efficiency of the circuit.

[**Ans**. (*a*) 20 V; (*b*) 12.7 mA; (*c*) 156.5 mW; (*d*) 79.56 %]

Q6[CO3]. For the circuit of Fig. 2, sketch v_o and determine V_{dc}. **[Ans.** 331 V (Peak), 99 V]

Q7[CO3]. The circuit of Fig. 3 uses two silicon diodes in parallel. The maximum power rating of each diode, P_{max} =14 mW. The input voltage v_i is a sinusoidal with peak value, V_m =150 V.

(a) Determine the maximum current rating of each diode.
(b) Determine I_{max} for $V_{i(max)}$ = 150 V.
(c)) Determine the current for each diode for V_m = 150 V.
(d) Is the current determined in part (*c*) less than the current rating determined in part (*a*) ?
(e) If only one diode were present, determine the diode current and compare it to the maximum current rating.

[Ans. (*a*) 20 mA; (*b*) 29.86 mA; (*c*) 14.93 mA; (*d*) Yes; (*e*) I_D (=29.86 mA) > I_{max}(20 mA)]

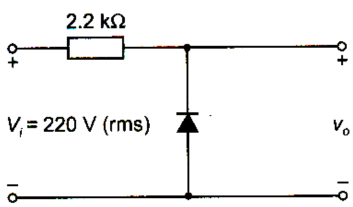

Fig. 2

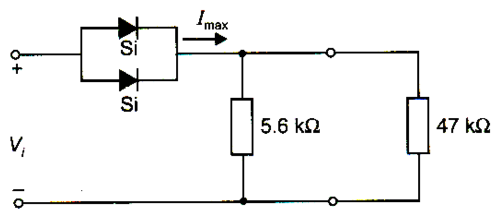

Fig. 3

Q8[CO3]. The input v_i to the circuit of Fig. 4 is a sinusoidal voltage of peak value 150 V. Assuming ideal diodes, sketch the output voltage v_o and determine its dc value.

[Ans. Full-wave rectified wave with peak value = 50 V, –31.8 V]

Q9[CO3]. The input v_i to the circuit of Fig. 5 is a floating sinusoidal voltage of peak-to-peak value 200V, obtained from an isolation transformer. Assuming ideal diodes, sketch the output voltage v_o and determine its dc value.

[Ans. Full-wave rectified wave with peak value = 50 V, 31.8 V]

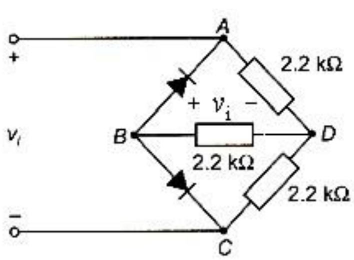

Fig. 4

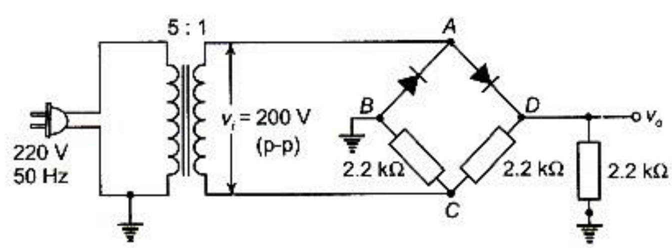

Fig. 5