

**JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY**  
**Electronics and Communication Engineering**  
**Electrical Science-2 (15B11EC211)**  
**Tutorial Sheet: 12**

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1. [CO3] Fig. 1 shows a loaded Zener regulator. If the Zener diode is disconnected, what is the load voltage? (Ans. 16.39 V)

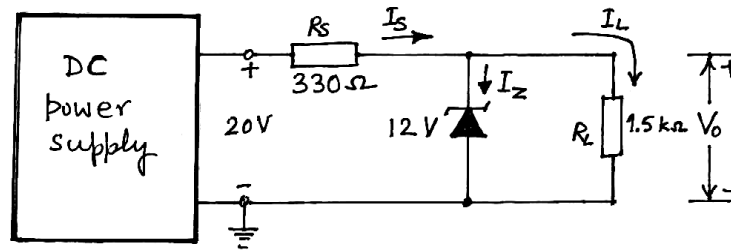
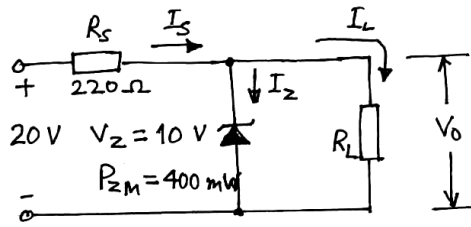
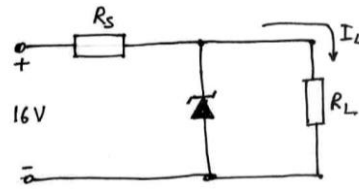


Fig. 1

2. [CO3] Suppose that the dc supply voltage in the circuit of Fig. 1 slowly decreases from 20V to 0V. At some point along the way, the Zener diode will stop regulating. Find the supply voltage where regulation is lost. (Ans. 14.64 V)
3. [CO3] Calculate all the three currents in Fig. 1. (Ans. 24.24 mA, 16.24 mA, 8 mA)
4. [CO3] Assuming a tolerance of  $\pm 10\%$  in both resistors of Fig. 1, what is the maximum Zener current? (Ans. 19.67 mA)
5. [CO3] Suppose that the dc supply voltage of Fig. 1 can vary from 20V to 40V. What is the maximum Zener current? (Ans. 76.8 mA)
6. [CO3] Calculate the power dissipation in the resistors and Zener diode of Fig. 1. (Ans. 193.92 mW, 96 mW, 194.88 mW)
7. [CO3] During the day, the ac supply voltage changes. This causes the output of the unregulated dc power supply to vary from 17.5V to 21V. If the Zener resistance is  $11.5\Omega$ , what is the corresponding change in the output voltage of the regulator of Fig. 1? (Ans. 12.1 V to 12.221 V)
8. [CO3] What is the minimum load resistance that may be used in Fig. 1 without losing Zener regulation? (Ans. 495  $\Omega$ )
9. [CO3] The unregulated voltage in Fig. 1 may vary from 16V to 23V, and the load current may vary from 1 to 25 mA. Will the zener regulator stop regulating under these conditions? If so, what is the maximum value of  $R_S$ ? (Ans. Yes, 160  $\Omega$ )
10. [CO3] Figure 2 shows a zener voltage regulator circuit. Determine  $V_o$ ,  $I_L$ ,  $I_Z$  and  $I_S$ , if  $R_L = 180\Omega$ . (Ans. 9 V, 50 mA, 0 mA, 50 mA)



**Fig. 2**



**Fig. 3**

11. [CO3] Repeat Prob. 10, if  $R_L = 470\ \Omega$ . (Ans. 10 V, 21.28 mA, 24.17 mA, 45.45 mA)
12. [CO3] Design the zener regulator circuit of Fig. 3 to maintain  $V_L$  at 12V for a load ( $I_L$ ) variation from 0 to 200 mA. That is, determine  $R_S$  and  $V_Z$ . (Ans. 20  $\Omega$ , 12V)