

ELECTRONIC CIRCUITS

FUNDAMENTALS AND APPLICATIONS

QUESTION SET D

Target time: 60 minutes

1. Resistors of $22\ \Omega$ and $68\ \Omega$ are connected in series across a DC supply of 18 V. Determine the current supplied and the voltage drop that will appear across each of the two resistors. Also determine the value of additional series resistance that, when added, will cause the supply current to fall to 150 mA.

2. Identify the component shown in Figure 1. Sketch the circuit symbol for the device and describe a typical application for it.



Figure 1 See Question 2

3. Figure 2 shows an AC circuit. Determine (a) the current supplied to the circuit; (b) the voltage appearing across the $220\ \Omega$ resistor; (c) the voltage appearing across the $2.2\ \mu\text{F}$ capacitor; and (d) the phase angle between the supply voltage and current.

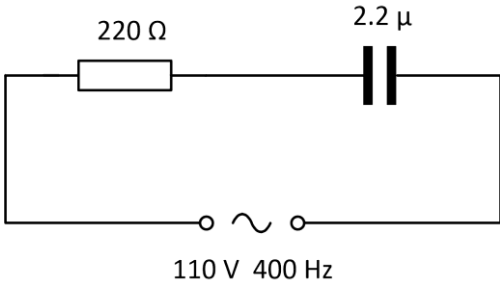


Figure 2 See Question 3

4. A transformer has 440 primary turns and 64 secondary turns. The primary is connected to a 220 V AC supply and the secondary is connected to a load resistance of 18Ω . Assuming that the transformer is loss-free, determine: (a) the secondary voltage; (b) the secondary current; (c) the primary current; (d) the power dissipated in the load.

5. Identify the logical function of the integrated circuit shown in Figure 3. Draw sketches to show how this device can be connected to form (a) a three-input OR gate; and (b) a two-input AND gate.

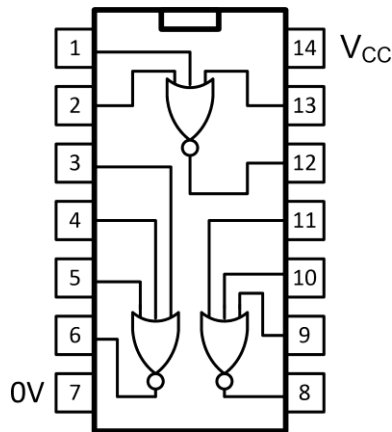


Figure 3 See Question 5

6. Sketch a circuit showing how a bipolar junction transistor (BJT) can be connected as an emitter follower. Explain how the voltage gain and input resistance of this circuit differs from that of a common emitter BJT amplifier.

7. A zener diode rated at 6.8 V is connected to a 12 V DC supply via a fixed series resistor of 120Ω . Determine the current flowing in the resistor, the power dissipated in the resistor and the power dissipated in the zener diode.

8. Show, with the aid of a circuit diagram, how a threshold temperature sensor can be made with an operational amplifier connected as a comparator. Label your diagram clearly and briefly explain the operation of the circuit.

9. Sketch the block schematic of a simple microprocessor system. Label your diagram clearly and briefly explain the function of each block. Describe a typical application for the system.

10. Figure 4 shows the frequency response of an amplifier.
- (a) Determine the mid-band voltage gain and express your answers in decibels (dB)
 - (b) Determine the upper and lower cut-off frequencies of the amplifier.

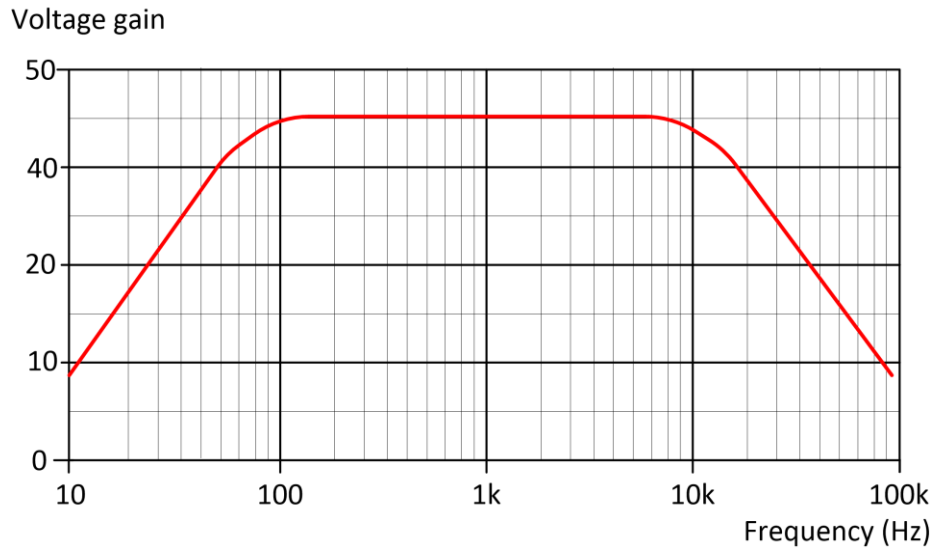


Figure 4 See Question 10