

ELECTRONIC CIRCUITS

FUNDAMENTALS AND APPLICATIONS

QUESTION SET E

Target time: 60 minutes

1. Determine the equivalent resistance of each of the networks shown in Figure 1.

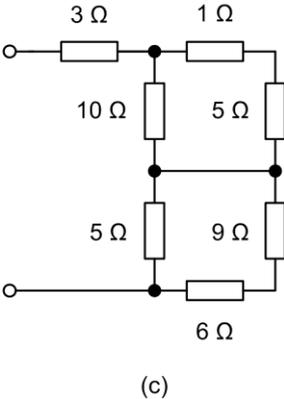
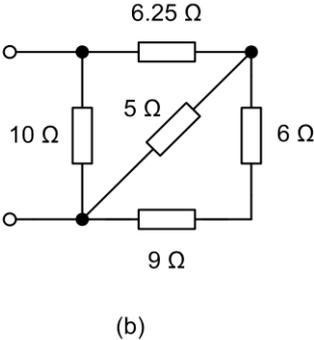
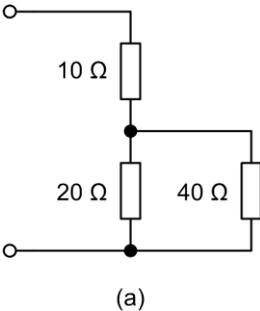


Figure 1 See Question 1

2. Determine the reactance at 500 Hz of: (a) a 33 mH inductor; and (b) a 68 nF capacitor.

3. A sinusoidal AC supply has a frequency of 60 Hz and an r.m.s. value of 110 V.
- Determine the periodic time and peak value of the supply
 - Write down an expression for the instantaneous voltage of the supply at a time, t .

4. Identify the diode circuit configuration shown in Figure 2. Describe, with the aid of a circuit diagram, an application for this circuit. Explain, briefly, how the circuit operates.

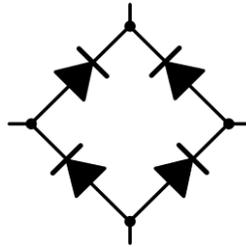


Figure 2 See Question 4

5. A quantity of 220 μF capacitors is available, each rated at 250 V working. Determine how several of these capacitors can be connected to produce an equivalent capacitance of:
- 110 μF at 500 V;
 - 440 μF at 250 V;
 - 220 μF at 500 V; and
 - 55 μF at 1 kV.
- Illustrate your answers with circuit diagrams.

6. An amplifier has identical input and output resistances and provides a voltage gain of 36 dB. Determine the output voltage produced if an input of 20 mV is applied.

7. Sketch a logic gate arrangement using only two-input NAND gates that will have the logic function shown in Figure 3. Simplify your arrangement as far as possible.

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Figure 3 See Question 7

8. Identify the component shown in Figure 4. Sketch the circuit symbol for this component and briefly describe a typical application for it.



Figure 4 See Question 8

9. Identify one type of sensor for use in each of the following applications: (a) measuring the pressure exerted on the inner wall of a submersible vessel; (b) determining the light level in a hallway; (c) detecting the maximum level of fuel in a tank; (d) measuring the temperature of a soldering iron bit. In each case briefly explain how the sensor is interfaced with typical electronic circuitry.

10. Explain what is meant by the term *negative feedback*. Illustrate your answer with a block diagram showing a typical application in which negative feedback is used.