

6(a)	series charges: $Q_s = Q_1 = Q_2$
	series p.d.s: $V_s = V_1 + V_2$
	parallel charges: $Q_s = Q_1 + Q_2$
	parallel p.d.s: $V_s = V_1 = V_2$
6(b)(i)	$E = \frac{1}{2} CV^2$
	p.d. = $[(2 \times 19 \times 10^{-3}) / (470 \times 10^{-6})]^{\frac{1}{2}}$
	= 9.0 V
6(b)(ii)	$E = Q^2 / 2C$ or $C = Q / V$
	$Q = (19 \times 10^{-3} \times 2 \times 470 \times 10^{-6})^{\frac{1}{2}}$ or $Q = 470 \times 10^{-6} \times 9.0$
	$Q = 4.2 \times 10^{-3} \text{ C}$
6(b)(iii)	total charge unchanged
	total capacitance = $(470 + 180) \times 10^{-6} \text{ (F)}$
	$E = Q^2 / 2C = (4.23 \times 10^{-3})^2 / (2 \times 650 \times 10^{-6})$ (= 0.014 J)
	$E = 14 \text{ mJ}$

6(a)(i)	conversion of a.c. to d.c.
6(a)(ii)	full-wave (rectification)
6(a)(iii)	three diodes with correct symbols connected into the circuit
	lower-left diode shown pointing towards the right and upper-left and lower-right diodes both shown pointing towards the left
6(b)(i)	$\omega = 18 \text{ (rad s}^{-1}\text{)}$
	$T = 2\pi / 18 = 0.35 \text{ s}$
6(b)(ii)	$V_{\text{r.m.s.}} = 34 / \sqrt{2}$
	= 24 V
6(b)(iii)	sinusoidal 'humps' with minimum $V_{\text{OUT}} = 0$ and non-zero V_{OUT} all same sign
	peak V_{OUT} shown as 34 V or -34 V
	two 'humps' shown, with V_{OUT} always with same sign and $V_{\text{OUT}} = 0$ at $t = 0$, $t = 0.175 \text{ s}$ and $t = 0.350 \text{ s}$ and non-zero in between
6(c)(i)	correct circuit symbol for capacitor, connected in parallel with resistor
6(c)(ii)	time constant = RC
	= $56 \times 10^3 \times 12 \times 10^{-6}$
	= 0.67 s
6(c)(iii)	$V_{\text{min}} = 34 \exp(-0.14 / 0.67)$
	= 28 V

7(a)	$V_C = V_R$
7(b)(i)	$C = Q / V$
	= $(7.2 \times 10^{-3}) / 12$ (= $6.0 \times 10^{-4} \text{ F}$)
	= 600 μF
7(b)(ii)	$R = V / I$
	= $12 / (1.5 \times 10^{-3})$ (= 8000 Ω)
	= 8.0 k Ω
7(b)(iii)	$\tau = RC$
	= $8000 \times 6.0 \times 10^{-4}$
	= 4.8 s
7(c)	Any two points from: - charge and current are both (directly) proportional to voltage - charge is (directly) proportional to current - current is the rate of change of charge
	Q is proportional to the rate of change of Q (so exponential variation)