

Tutorial Questions

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1.	A voltage given by this equation $v = 200 \sin \omega t$ is applied across a pure resistance of $1.5 \text{ k}\Omega$. Find the power dissipated in the resistor.	3
	$V_0 = 200 \text{ V}$	✓
	$V_{\text{RMS}} = 200 \div \sqrt{2} = 141 \text{ V}$	✓
	$P = \frac{V^2}{R} = \frac{141^2}{1500} = 13 \text{ W}$	✓
2.	A $50 \mu\text{F}$ capacitor is connected to a 100 V 200 Hz supply. Determine	
(a)	The true power	2
	True power = 0	✓
	as there is no resistive element.	✓
(b)	The apparent power	2
	Reactance = $\frac{1}{2\pi f c} = \frac{1}{2 \times \pi \times 200 \times 50 \times 10^{-6}} = 15.9 \Omega$	✓
	$S = \frac{V^2}{X_c} = 100^2 \div 15.9 = 628 \text{ VA}$	✓
(c)	The power factor	2
	$\cos \phi = 0$	✓
	$628 \times 0 = 0$ (really?)	
	Phase angle is 90° .	✓
3.	A motor takes a current of 10 A from a 230 V supply. Assuming a power factor of 0.75 lagging, work out the true power of this motor.	3
	$P = VI \cos \phi$	✓
	$= 230 \times 10 \times 0.75$	✓
	$= 1725 \text{ W}$	✓

4.	A machine tool in a catalogue has a power of 2200 W and is to be connected to a 230 V 50 Hz AC supply. Its power factor is 0.707.		
(a)	Work out the current that this machine should take if all the supply was used to provide power. Would a 13 A plug do?		3
	$I = \frac{P}{V} = \frac{2200}{230}$		✓
	$I = 9.57 \text{ A}$		✓
	A 13 A plug would handle this		✓
(b)	The retailer states that a 16 A supply is required.		
(i)	Explain why this is the case.		2
	The power used is greater than the true power, as the motor is reactive		✓
			✓
(ii)	Calculate the apparent power		3
	$S = P \div \cos \phi$		✓
	$S = 2200 \div 0.707$		✓
	$= 3112 \text{ VA}$		✓
(iii)	Calculate the resulting current		2
	$S = VI \Rightarrow I = \frac{3112}{230}$		✓
	$= 13.5 \text{ A}$		✓
(iv)	What kind of reactive load does the motor provide? Explain your answer.		3
	The reactive load is inductive.		✓
	There are lots of coils of wire		✓
	and big lumps of magnetic materials		✓

Total = 25 marks
