

UE25EE141A – UNIT 2 – ASSIGNMENT – ANSWER KEY

Lecture 20

1. 3.33ms

Lecture 21

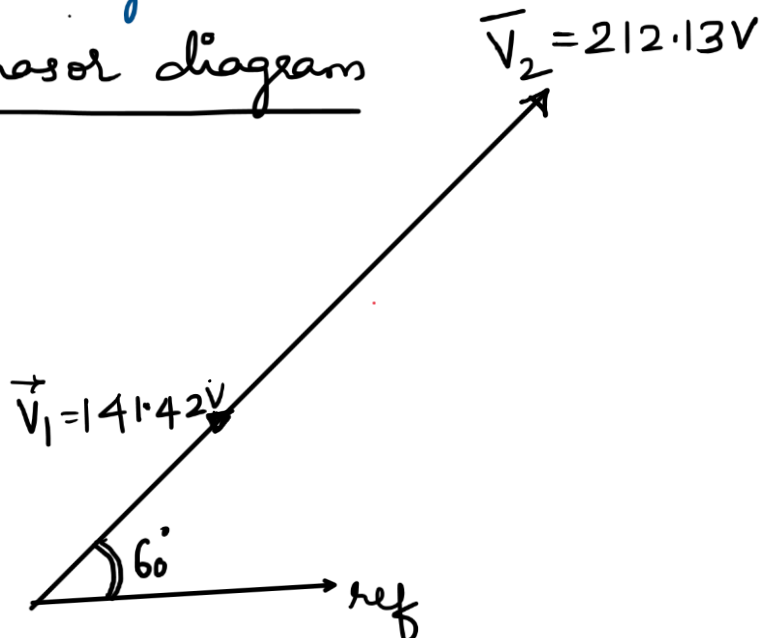
$$\text{Let } \vec{V}_1 = \frac{200}{\sqrt{2}} \angle 60^\circ = 141.42 \angle 60^\circ$$

$$V_2(t) = 300 \sin(100\pi t + 60^\circ)$$

$$\vec{V}_2 = \frac{300}{\sqrt{2}} \angle 60^\circ = 212.13 \angle 60^\circ$$

Voltages $V_1(t)$ and $V_2(t)$ are in PHASE

Phasor diagram



Lecture 22

1. Resultant EMF $e(t) = 53.53\sin(\omega t + 17.77^\circ)$ V

Maximum value of Resultant EMF is 53.53V

Resultant EMF lags $e_2(t)$ by 72.23°

Lecture 23

1.

i) Inductive Reactance = 31.41Ω

ii) $i(t) = 3.183\sin(100\pi t - 90^\circ)$ V

Lecture 24

i) $P = VI\cos\phi = 250\text{W}$

$Q = VI\sin\phi = 433\text{ VAR}$

$S = VI = 500\text{ VA}$

ii) Power factor = 0.5 Lag

Lecture 25

1. $i(t) = 4\sin(\omega t - 44.97^\circ)\text{A}$

$P = 400.44\text{ W}$; $Q = 400.055\text{ VAR}$; $S = 566.31\text{ VA}$

Lecture 26

1. $R = 156.25\Omega$; $C = 5.75\mu\text{F}$

Lecture 27

1. $f = 50\text{Hz}$; $V = 34.21\text{V}$

Resistance of the coil = 25Ω

Inductance of the coil = 0.267H

Power dissipated in the coil = 4W

Total Power dissipated in the circuit = 12W

Lecture 28

1. i) Frequency of the supply = 50Hz

ii) $R = 12.94\Omega$, $L = 0.154H$

iii) $P = 207.28W$

Instantaneous expression of current under Resonance =
 $21.87\sin(100\pi t + 45^\circ) A$; $C = 65.91\mu F$

Lecture 29

$R = 20\Omega$; $C = 159.15\mu F$

Lecture 30

i) $Y_1 = 0.1 S$; $Y_2 = -j0.318 S$; $Y_3 = +j0.628 S$

ii) $Y_T = (0.1 + j0.31) S$

iii) Magnitude of Supply current = 6.51A

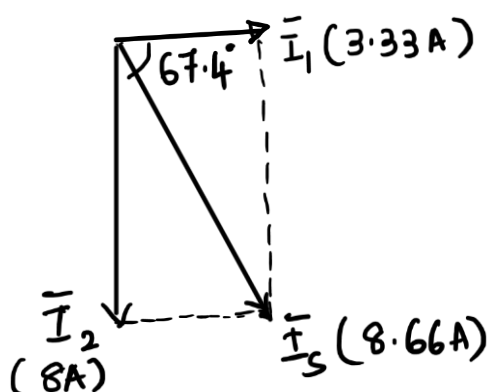
Lecture 31

1. $\bar{I}_1 = 3.33 \angle 0^\circ A$

$$\bar{I}_2 = 8 \angle 0^\circ A$$

$$\Rightarrow \bar{I}_S = \bar{I}_1 + \bar{I}_2 = 8.66 \angle -67.4^\circ A$$

Phasor diagram :



Lecture 32

1. $R1 = 3.89\Omega$; $X1 = 4.33\Omega$ & $X2 = 13.22\Omega$

Lecture 33

1. $[10.06 \angle 36.68^\circ \Omega, 19.88 \angle -36.68^\circ \text{ A}, 0.801 \text{ lagging}]$

2.

Consider V_s as reference

$$\bar{V}_s = 200 \angle 0^\circ \text{ V}$$

$$\bar{I}_1 = 7.5 \angle -57.71^\circ \text{ A}$$

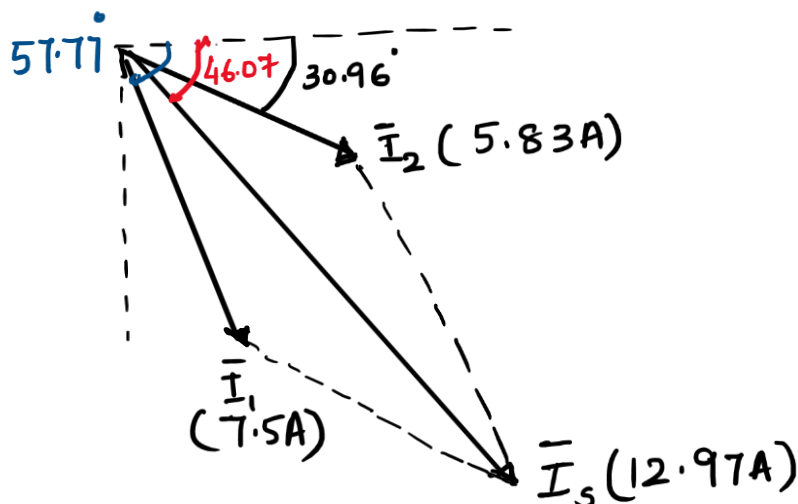
$$\bar{I}_2 = 5.83 \angle -30.96^\circ \text{ A}$$

$$\Rightarrow \bar{I}_s = 12.97 \angle -46.07^\circ \text{ A}$$

$$Z_T = \frac{\bar{V}_s}{\bar{I}_s} = (10.69 + j11.1) \Omega$$

$$R_{eq} = 10.69 \Omega \quad ; \quad X_{eq} = 11.1 \Omega$$

Phasor diagram:



Lecture 35

- i) $P_T = 10.5 \text{ kW}$
 $Q_T = 0.82 \text{ kVAR}$
 $S_T = 10.531 \text{ kVA}$
- ii) Overall power factor = 0.997 Lag
- iii) To raise power factor to unity, a capacitor with kVAR rating of 0.82kVAR must be connected in parallel.