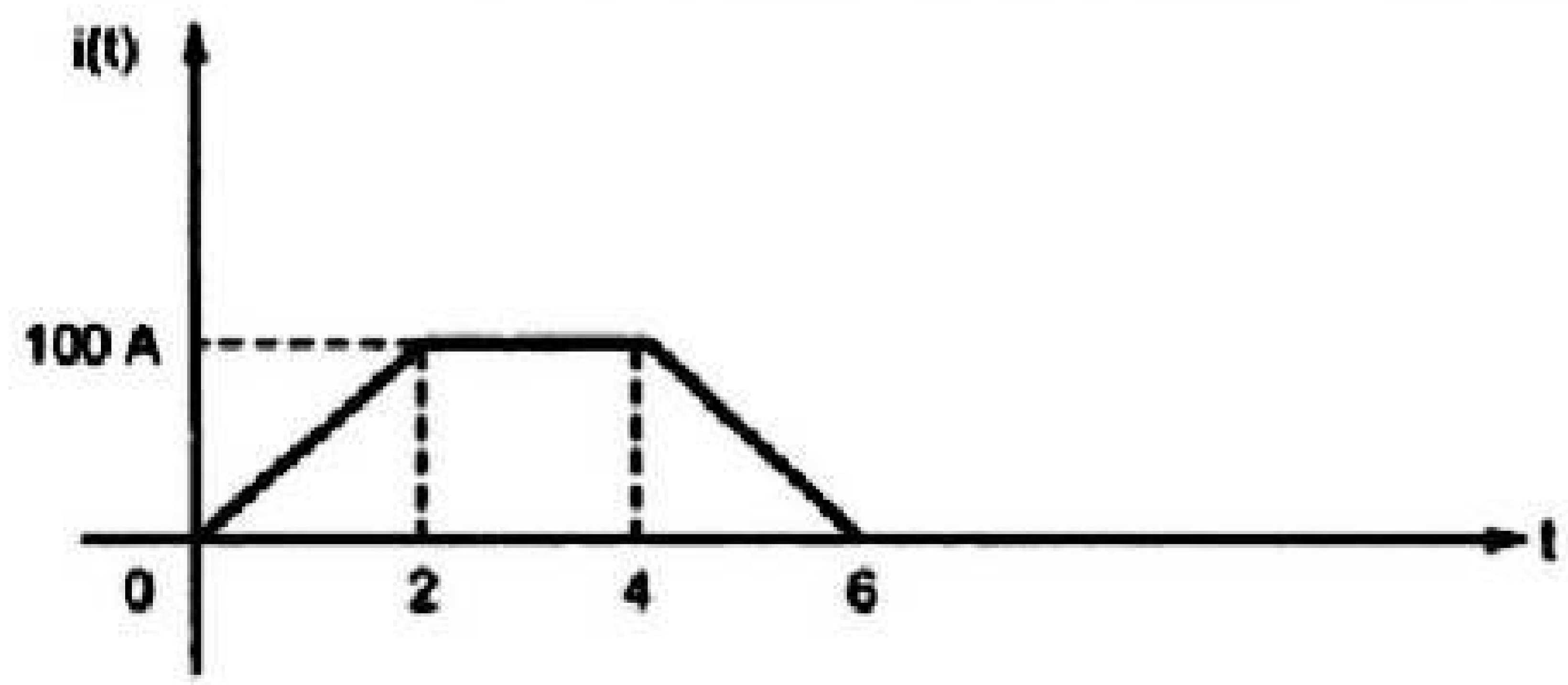
Department of Electrical Engineering
Assignment
Date: 20/08/2020

Course Details

Course Title: Electrical Network Analysis
Instructor:
Module: B-tech
Total Marks: 30

Student Details

Name: Shehriyar khan
Student ID: 13738

Q1	(a)	For the circuit shown below, calculate the voltage V, the conductance G, and the power P. 	Marks 05
	(b)	A resistor absorbs an instantaneous power of 20 $Cos^2(t)mW$ when connected to a voltage source V = 10cos(t) v. Find I and R?	Marks 05
Q2	(a)	The current in a 4H inductor raises at a rate of 4A/s .Find the voltage across the inductor the energy stored in the magnetic field at after 2sec.	Marks 04
	(b)	A current waveform flowing through an inductor of 1mH is shown in the figure. Obtain and sketch the waveform of voltage across the inductor. 	Marks 06
Q3	(a)	A series RLC circuit containing a resistance of 12Ω, an inductance of 0.15H and a capacitor of 100uF are connected in series across a 100V, 50Hz supply. Calculate	Marks 07

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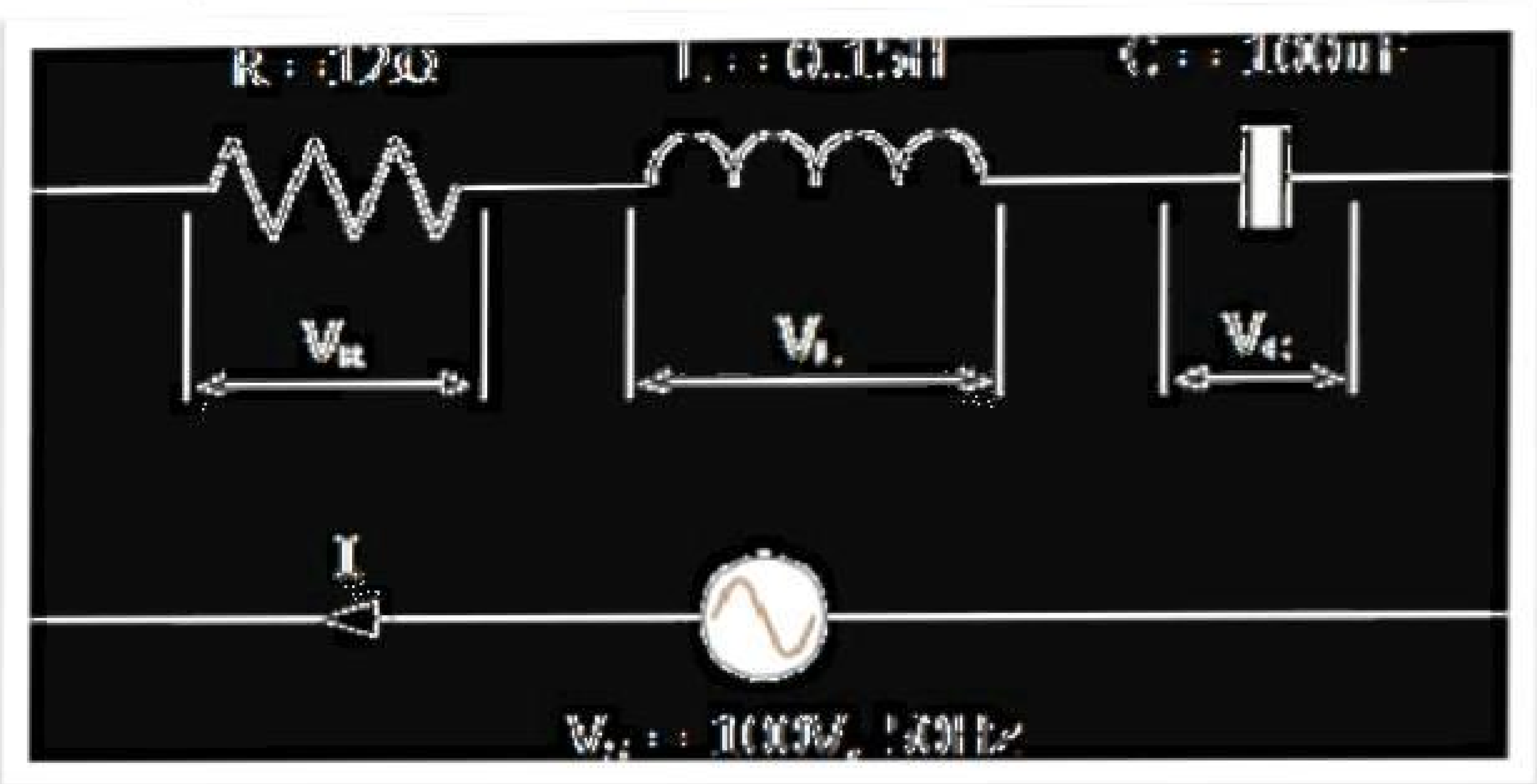
the total circuit impedance, the circuits current, power factor and draw the voltage phasor diagram.

R=12 0hms,L=0.15H,C=100 micro Farad,Vs=100V,50HZ



	(b)	Write a short note on under damped ,over damped and under damped?	Marks 03

☺Good Luck☺

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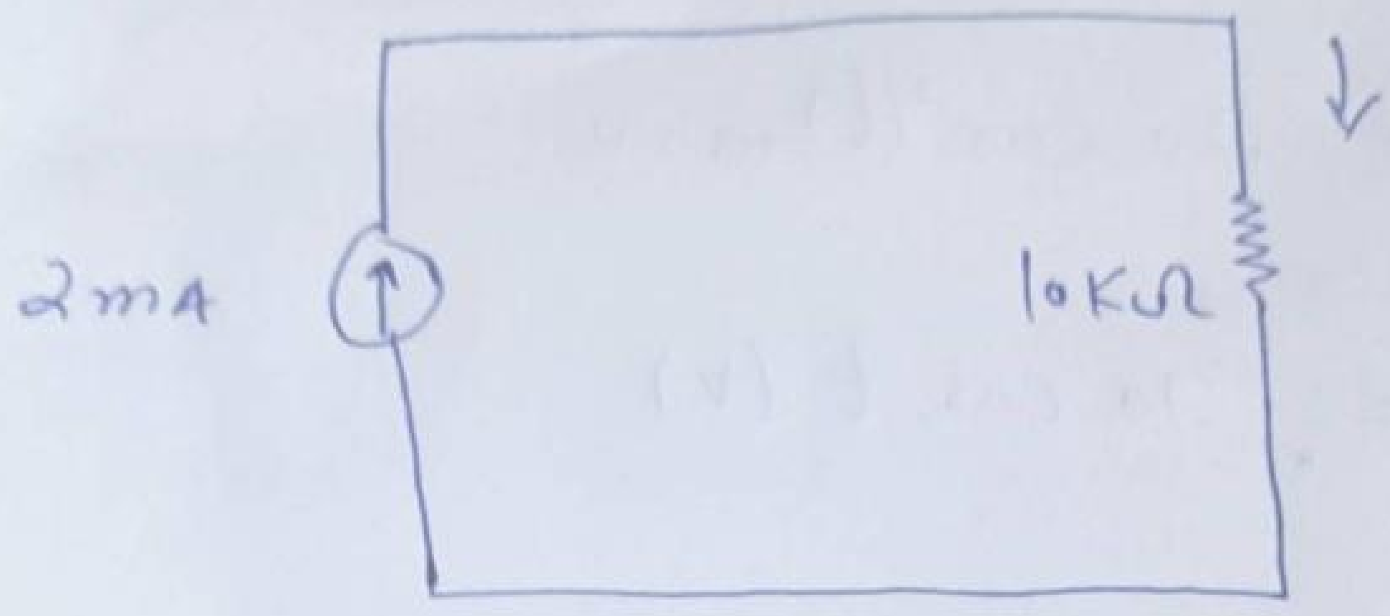
Shehriyar Khan

13738 BE(Electrical)

Q No (1)(a)

Sol:-



$I = 2\times10^{-3}$ $R = 10\,K\Omega$

$V = IR$

$V = (2\times10^{-3})(10\times10^{3}\,\Omega)$

$V = 20\ V$

$V = IR$

$R = V/I$ $\because R = 1/c$

$1/c = V/I$

$c = I/V$

$= 2\times10^{-3}/20$

$C = 0.001$

$P = VI = 20 \times 2\times10^{-3}$

$p = 0.2W$

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QNo 1(b)

Sol:-

$$P = 20\cos^2(t)\ mW$$

$$V = 10\cos t\ (V)$$

$$P = Vi$$

$$i = P/V$$

$$i = \frac{20\cos^2 t \times 10^{-3}}{10\cos t}$$

$$i = 20\cos t \times 10^{-3}$$

$$\boxed{i = 2\cos t\ mA}$$

$$V = IR \implies R = V/I$$

$$= \frac{10\cos t\,(V)}{2\cos t \times 10^{-3}}$$

$$= 5 \times 10^{3}\ \Omega$$

$$R = 5\ K\Omega$$

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Q No 2 (a)

Sol:-

$$V = L\, di/dt$$

$$\Rightarrow 4 \times 4 = 16\,V$$

$$\boxed{V = 16\,V}$$

$$W = \tfrac{1}{2} L i^2 \,(4)^2$$

$$= \tfrac{1}{2}\, 4\, (4)^2$$

$$= 2 \times 16$$

$$W = 32\,J = 32\,j.$$

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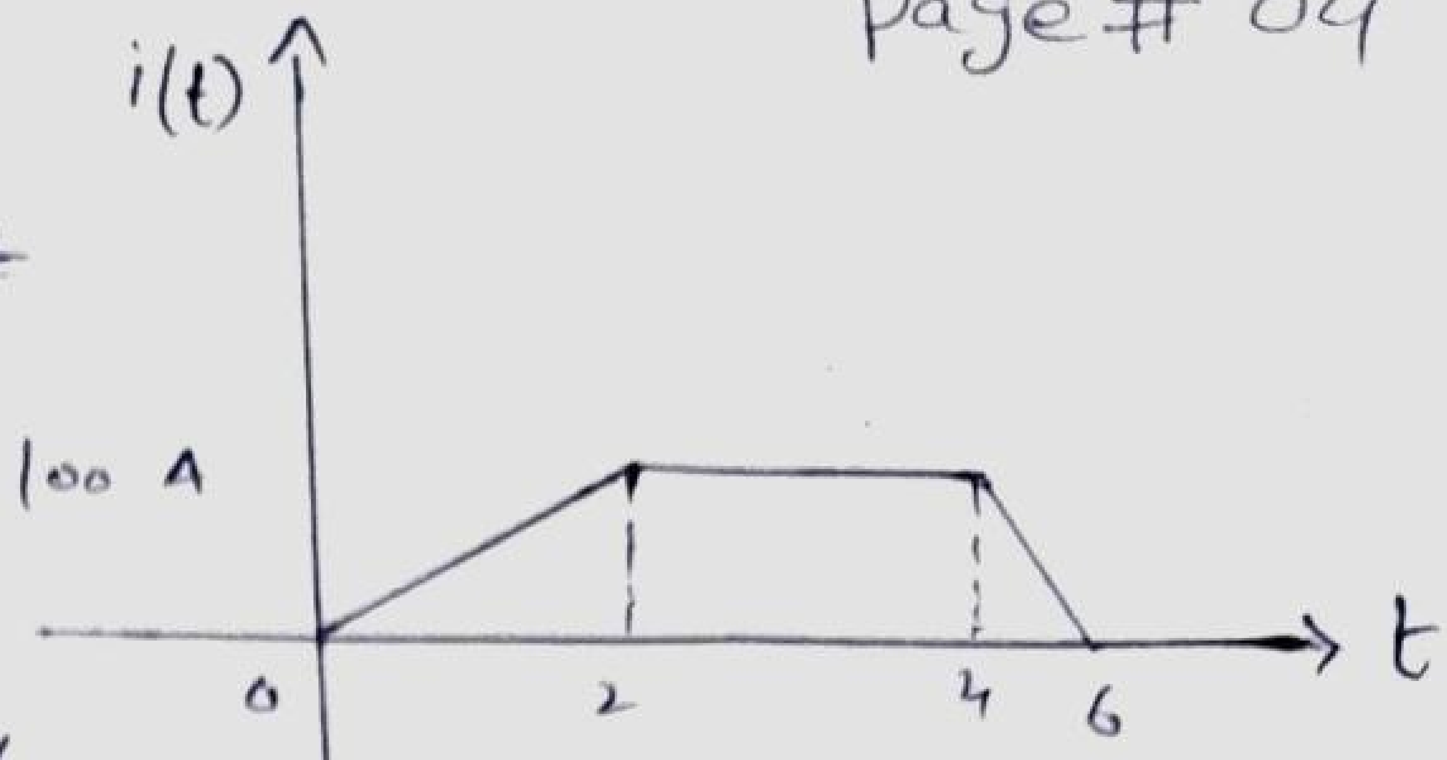
QNo 2 (b)

Sol:-

[redacted]



from the given wave form :

for $0 < t < 2$, $i(t)$ is a straight line of slope

$= (100/2) = 50$

Therefore $i(t) = 50t$ and $\frac{di(t)}{dt} = 50$.

for $2 < t < 4$, $i(t) = 100$ and $\frac{di(t)}{dt} = 0$

for $4 < t < 6$, $i(t)$ = is a straigh line of slope

$= -(100/2) = -50$

Therefore, $i(t) = -50t$ and $\frac{di(t)}{dt} = -50$.

Now $v_L(t) = L \, di(t)/dt$

$= 1 \times 10^{-3} \times 50 = 0.05\,V \quad 0 < t < 2$

$= 1 \times 10^{-3} \times 0 = 0\,V \quad 2 < t < 4$

$= 1 \times 10^{-3} \times -50 = -0.05\,V \quad 4 < t < 6$

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Q No 3(a) $L = 0.15\,H$ $C = 100\,\mu F$
$R = 12\,\Omega$

Sol:- Inductive Reactance, X_L

$$X_L = 2\pi f L = 2\pi \times 50 \times 0.15 = 47.13\,\Omega.$$

Capacitive Reactance.

$$X_C = 1/2\pi f c = \frac{1}{2\pi \times 50 \times 100 \times 10^{-6}} = 31.83\,\Omega.$$

circuit impedence, Z.

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$= \sqrt{12^2 + (47.13 - 31.83)^2}$$

$$Z = \sqrt{144 + 234} = 19.4\,\Omega.$$

circuits current I.

$$I = V_s/Z = 100/19.4 = 5.14 \text{ amps.}$$

voltage across the Series RLC circuits,
VR, VL, VC.

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$V_R = I \times R = $ ~~5 × 14~~ $5.14 \times 12 = 61.7$ volts.

$V_L = I \times X_L = 5.14 \times 47.13 = 242.2$ volts.

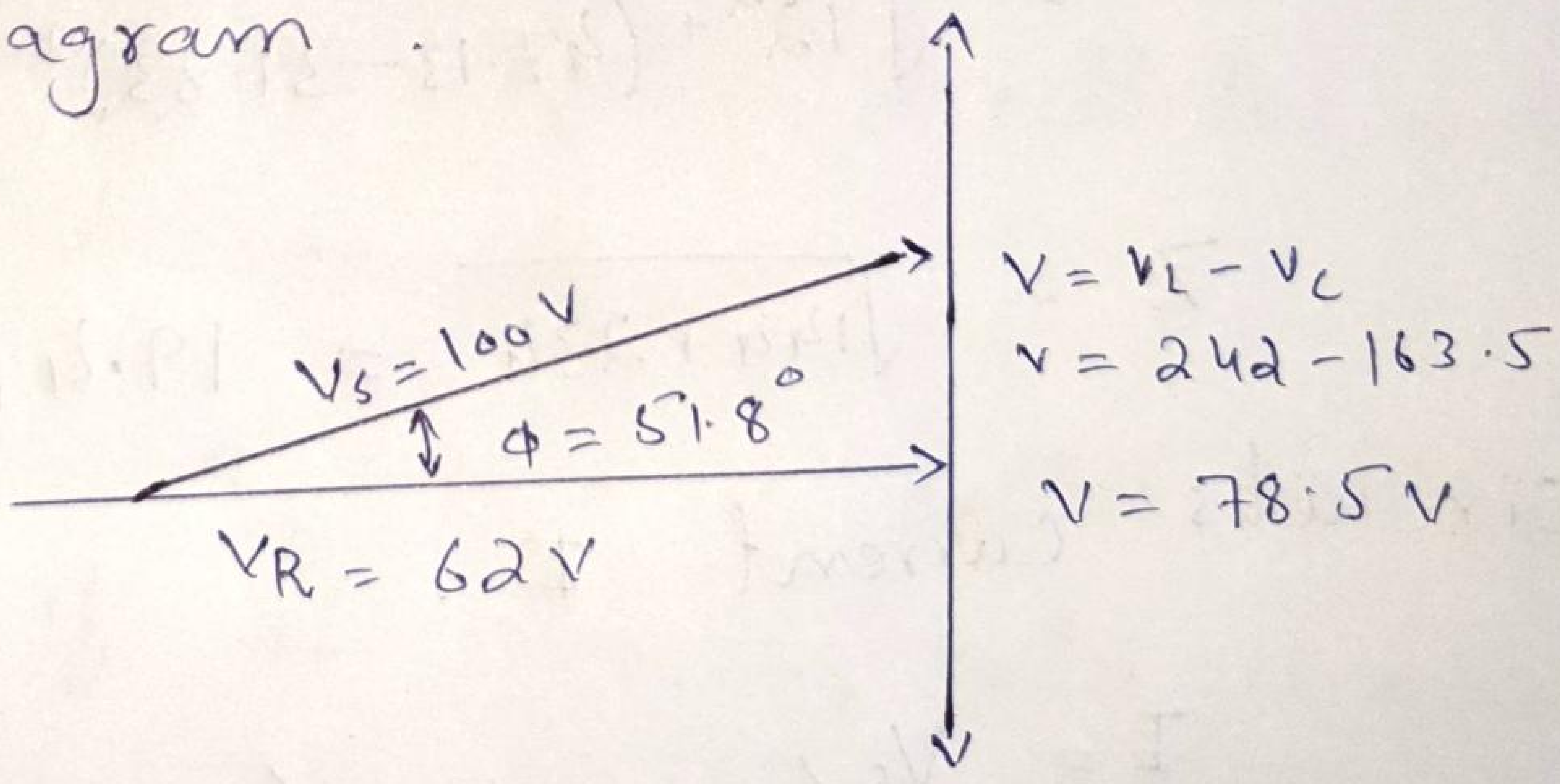
$V_C = I \times X_C = 5.14 \times 31.8 = 163.5$ volts.

circuits power factor and Phase Angle, θ

$\cos\phi = R/Z = 12/19.4 = 0.619$.

$\cos^{-1} 0.619 = 51.8°$ lagging.

Phasor Diagram.



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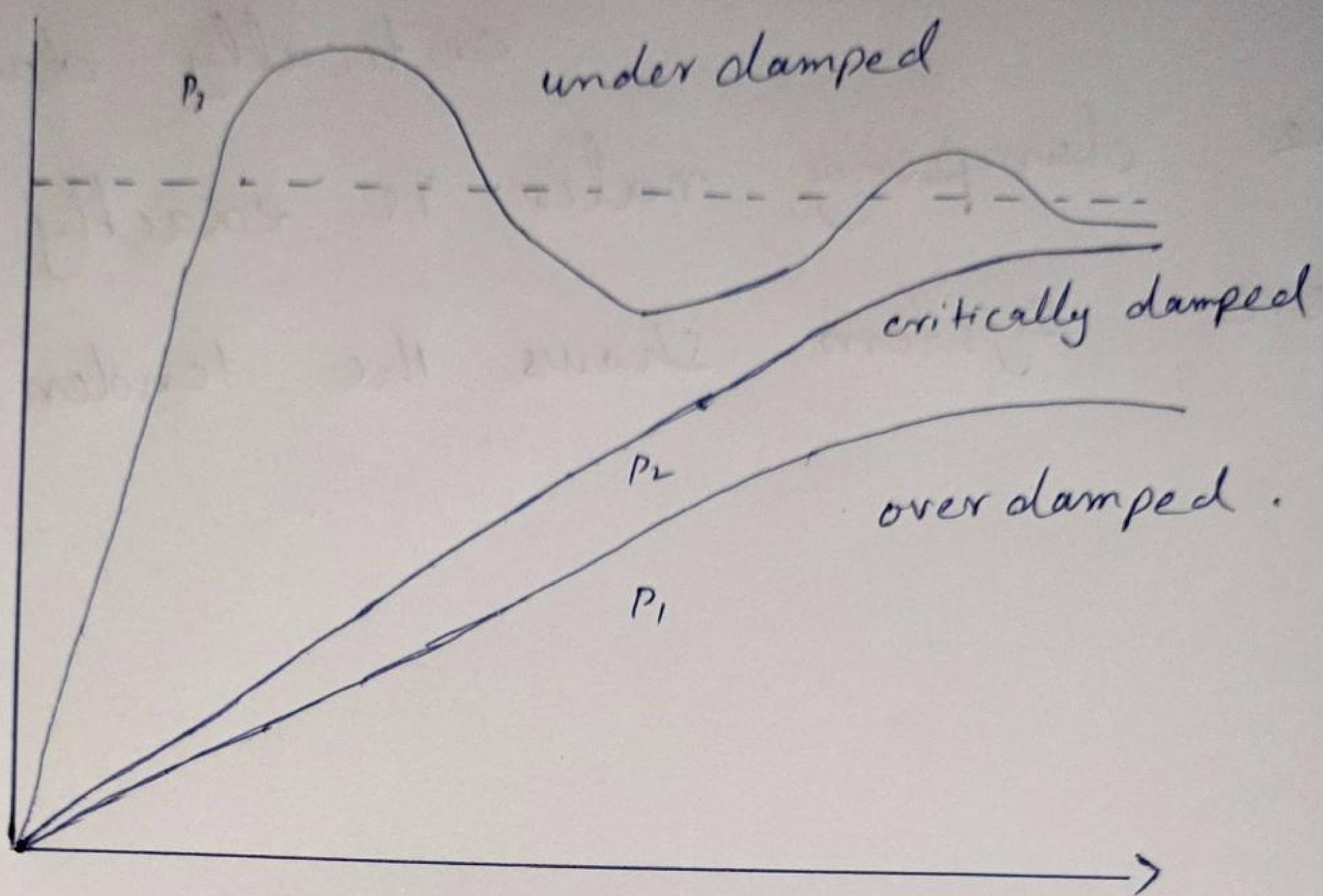
Q No (3) (b)



i) under damped:- A system is called under damped, if the damping ratio is less then 1. Here the system oscillates with a gradual descrements.

ii) over damped:- A system is called overdamped if the damping ratio is greater then one. Here the system shows tendency to achieve equilibrium with out oscillating

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ii) Critically damped:- A syslem is called critically damped if the damping ratio is exactly one. Here system shows the tendencies.

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