केवल मूल्यांकनकर्ता के उपयोग हेतु!

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल 32 पृष्ठीय

केवल परीक्षक द्वारा भरा जावे। प्रश्न क्रमांक के सम्मुख प्राप्तांकों की प्रविष्टी करें।

प्रश्न क्रमांक	पृष्ठ क्रमांक	में)	प्रश्न क्रमांक	पृष्ठ क्रमांक	में)
1			17		
2			18		
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परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे →

प्रमाणित किया जाता है कि अन्दर के पृष्ठों के अनुरूप मुख्य पृष्ठ पर अंकों की प्रविष्टी एवं अंकों का योग सही है।

निर्धारित मुद्रा : नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं [redacted] की मुद्रा लगाएं।

उप मुख्य [redacted]

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Answer of Que. no. 01.

Choose the correct option :-

Ans (i) $R = 2f$.

Ans (ii) Isobar

Ans-(c) (iv) Immobile ions.

Ans-(d) (ii) Polarisation

Ans-(e) (i) Material of wire

Ans-(f) (iv) Oersted.

Answer of Que no. 02.

Fill in the blanks :-

Ans-(a) Displacement current

Ans-(b) objective

Ans-(c) conduction

Ans-(d) Holes

Ans-(e) decreases

Ans-(f) Diamagnetic substances.

Answer of Que no. 03.

True / False :-

Ans(a) True
Ans(b) False.
Ans-(c) False
Ans(d) True
Ans-(e) False.

Answer of Que no. 04.

Match :-

	'Answers'
Electromagnetic wave	(VI) Maxwell.
(b) Double-slit experiment of interference	(VII) Young
(c) Dual-nature of matter	(V) De-Broglie
(d) Mass-energy-equivalence relation	(II) Einstein
(e) Electrostatic force	(III) Coulomb

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(f) Direction of induced current	Lenz.

Answer of Que no. 05

Answer in one sentence :-

Ans-(a) Power factor for a pure resistive circuit is one.

Ans-(b) In condition of minimum deviation, the refracted ray inside the prism becomes parallel to prism base.

(c) P-type semiconductor is obtained.

Ans-(d) The total electric flux emanating from unit positive charge in air is $\frac{1}{\varepsilon_0}$ or $1.13 \times 10^{11}\ N m^2/C$

Ans-(e) Ammeter measures current in an electric circuit

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Answer of Que. no. 06. (OR)

If a light ray enters obliquely from an optically rare medium to an optically denser medium, then its velocity decreases and frequency remains unchanged.

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Answer of Que. no. 07

Following are the two conclusions obtained from the alpha particle scattering experiment :-

1. The entire positive charge and almost entire mass of the atom is concentrated in its centre. It is called nucleus of the atom.

2. Atom contains empty space around nucleus where electrons revolve and the necessary centripetal force is provided by the coulombian force of attraction blw negatively charged electron and positively charged nucleus.

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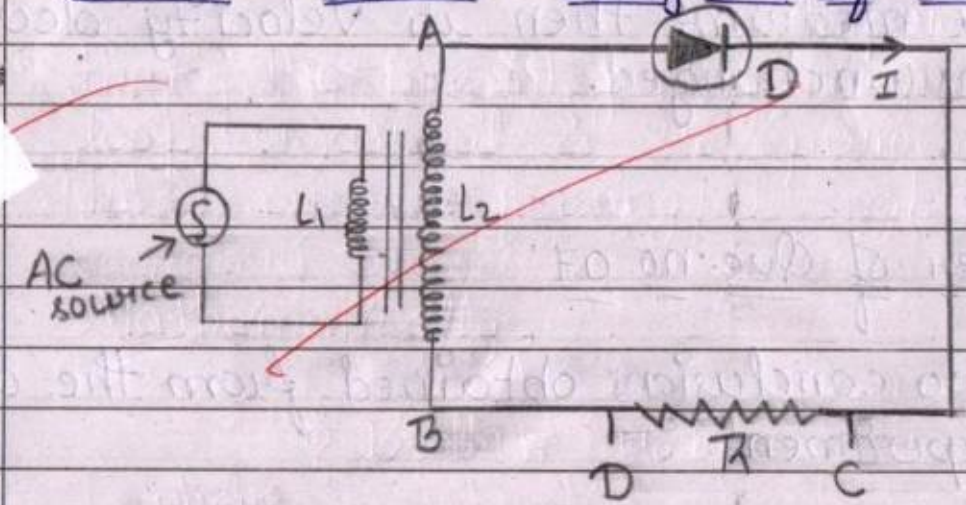
Answer of Que. no. 08 (OR)

Labelled Circuit Diagram of Half-wave rectifier :-



L_1 → Primary coil of step-up transformer
L_2 → Secondary coil of step-up transformer
R → Load resistance.
D → p–n junction diode

Answer of Que no. 09

Following are two characteristics of electric field lines :-

1. They ~~start from~~ are continuous smooth curves starting from positive charge and terminating at the negative charge.
2. Two electric field lines never intersect each other.

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Answer of Que no. 10.

Difference between self induction and mutual induction :-

	Self Induction	Mutual Induction
1.	When electric current flowing through a circuit changes, then an induced emf is produced due to which induced current starts flowing in the circuit which opposes its cause. This phenomenon is called self Induction.	1. When electric current flowing in a circuit changes, then an emf is induced in the neighbouring coil due to which induced current starts flowing through the neighbouring coil. This phenomenon is called mutual induction.
2.	Induced current directly affects the main current.	2. Induced current do not directly affects the main current.
3.	Only one coil is required.	3. Two coils are required.

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Answer of Que. no. 11.

Ampere's Circuital Law :-

Ampere's circuital law states that "The line integral of magnetic field around any closed loop or circuit is μ_0 (permeability of free space) times the total current passing through the loop or circuit."

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Mathematically,

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I$$

where,

B = magnetic field around the loop.
μ_0 = permeability of free space.
I = Total current passing through loop.

Answer of Que. no. 12. (OR)

The highest frequency electromagnetic wave is the gamma(γ) rays. It is used in the treatment of cancer and in the study of nuclear structures.

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Answer of Que. no. 13 (OR)

(I) **Definition of wave front :-**

Wave front, at any instant, can be defined as the locus of all those points, which are being disturbed at the same time and are in the same phase of vibration.

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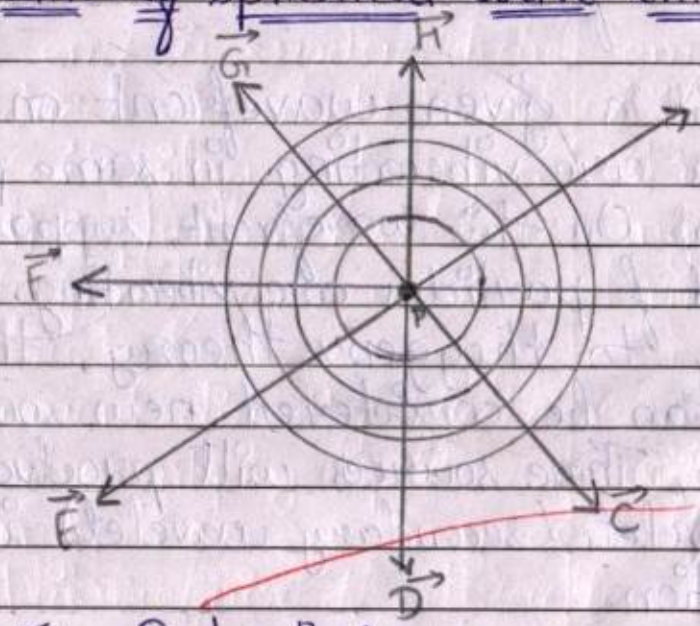
(II) **Ray Diagram of spherical wave emanating from point source :-**



P → point source.

Rays $\vec{A}, \vec{B}, \vec{C}, \vec{D}, \vec{E}, \vec{F}, \vec{G}, \vec{H}$ → perpendicular to spherical wavefront showing direction of light rays

Fig. Spherical waves emanating from point source.

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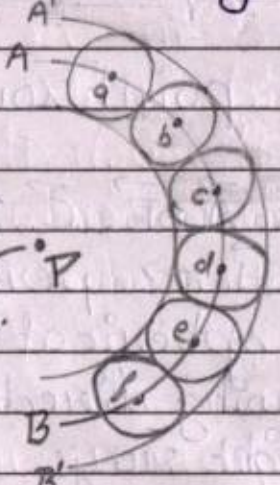
(iii) Emanation of secondary wavelets :-

→ According to Huygen's principle, "Every particle on a given wavefront (called primary wavefront) can be considered as a new source of disturbance which can produce its own wavelets called secondary wavelets in forward direction"



AB → primary wavefront
A'B' → secondary wavefront

Let AB be a given wavefront on which particles are vibrating in same phase of vibration. On this wavefront, suppose a, b, c d, e and f particles are vibrating. According to Huygen's theory, these sources can be considered new source of vibration. These sources will produce their own wavelets (secondary wavelets) in forward direction.

→ These wavelets move in all directions with the speed of light (3×10^8 m/s).

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→ The tanget joining all the secondary wavelet gives the direction of new wavefront (called secondary wave front.

Answer of Que. no. 14 (OR).

Three characteristics of photon :-

1. They are the quantum (packets) of light energy.
2. The rest mass of photon is zero.
3. One photon can emit one electron.

Answer of Que. no. 15.

Relation between emf, terminal voltage & Internal resistance of cell :-

Let us consider two circuits (a) and (b). In circuit (a), a cell of emf E ~~is connected to~~ and internal resistance r is

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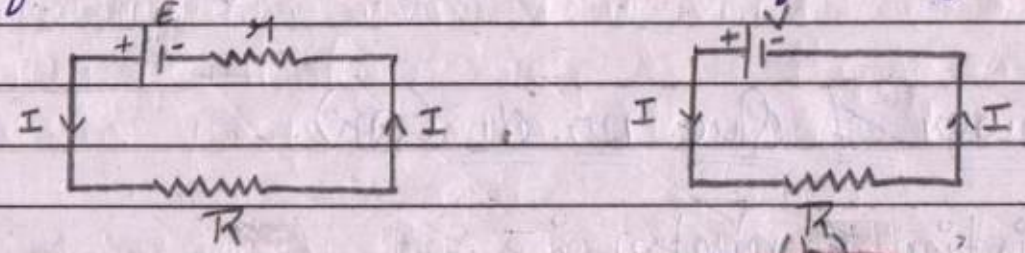
connected to external resistance R. In circuit (b), internal resistance is not taken into account, so the terminal voltage of cell is V. Current I is flowing through the circuits.



(a) Internal resistance taken into account

(b) Internal resistance not taken into account

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In circuit (a), total current can be determined by ohm's law as :-

$$I = \frac{\text{Total emf}}{\text{Total resistance}} = \frac{E}{r+R}$$

$$I(r+R) = E$$

$$Ir + IR = E$$

OR

$$E = Ir + IR \quad \text{---} \quad (1).$$

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In circuit (b), by ohm's law,

$$V = IR \quad \text{--- (2)}$$

Putting the value of V from eqn (2) in eqn (1), we get :-

$$E = Ir + V$$

or

$$\boxed{V = E - Ir}$$

This is the required relation between emf, terminal voltage and internal resistance of the cell.

Answer of Que. no. 16

Given :-
$l = 2\,m$
$N = 100$ turns
$I = 10\,A$
$\mu_0 = 4\pi \times 10^{-7}$

To find :- B.

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We know that :-

$$B = \mu_0 \frac{N}{l} I.$$

Putting the given values in above formula, we get :-

~~$B = 4\pi \times 10^{-7} \times \frac{100}{2} \times 5$ tesla.~~

~~$B = 4\pi \times 10^{-7} \times 10^{3}$ tesla.~~

~~$B = 4\pi \times 10^{-4}$ tesla.~~

~~$B = 4 \times 3.14 \times 10^{-4}$ tesla.~~

~~$B = 13.56 \times 10^{-4}$ tesla.~~

$$B = \frac{2}{4\pi} \times 10^{-7} \times \frac{100}{2_1} \times 10$$

$$B = 2 \times 3.14 \times 10^{-7} \times 10^{3}$$

$$B = 6.28 \times 10^{-4} \text{ tesla}.$$

$$\therefore \boxed{B = 6.28 \times 10^{-4} \text{ tesla}}.$$

Ans.

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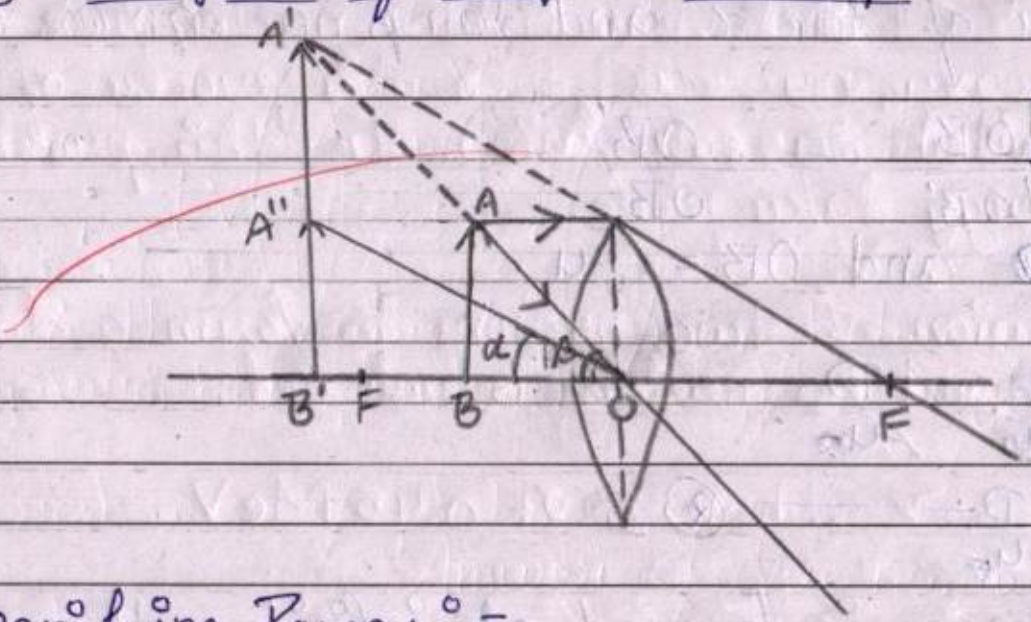
Answer of Que. no. 17 (OTR)

Ray Diagram of Simple microscope :-



AB = object.
A''B' = object at LDDV.
A'B' = final image.
OF = focus.
OB = object distance = -u
OB' = image distance = -v
OF = focal length = -f.

Magnifying Power :-

Magnification, $m = \frac{\text{Angle produced by image}}{\text{Angle by object at least distance of distinct vission.}} = \frac{\beta}{\alpha}$.

$m = \frac{\beta}{\alpha} \approx \frac{\tan\beta}{\tan\alpha}$ — (1). [Because α & β are very small angles]

In ΔABO,

$\tan\beta = \frac{AB}{OB}$

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In $\Delta A''B'O$:-

$$\tan\alpha = \frac{A''B'}{OB'} = \frac{AB}{OB'}$$ [Because $A''B' = AB$ as object is placed at LDDV].

Putting values of $\tan\alpha$ and $\tan\beta$ in eqn ①, we get:-

$$m = \frac{AB/OB}{AB/OB'} = \frac{OB'}{OB}.$$

But $OB' = -D$ and $OB = -u$.

$$\therefore m = \frac{-D}{-u}$$

$$m = \frac{D}{u} \quad \text{——— ②}$$

(a) When final image is formed at infinity, then,

$u = f$.

By lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

By eqn ②,

$$\boxed{m = \frac{D}{f}}$$ This is the magnification when image is formed at infinity.

(b) When image is formed at least distance of distinct vission :-

$V = -D$ & $u = -ve$.

$\therefore$ By lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{f} = \frac{1}{-D} - \frac{1}{-u}$.

$$\frac{1}{f} = -\frac{1}{D} + \frac{1}{u}.$$

$$\frac{D}{f} = -\frac{D}{D} + \frac{D}{u} \quad \text{(Multiplying both sides by } D\text{)}$$

$$\frac{D}{f} = -1 + \frac{D}{u}.$$

$$\frac{D}{u} = \frac{D}{f} + 1 \quad \text{——— (3)}.$$

By eqn (2) & (3) :-

$$\boxed{m = 1 + \frac{D}{f}}$$

This is the magnification when image is formed at least distance of distinct vision.

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Answer of Que. no. 18 . (OR)

→ **Nuclear Fusion :-**

When two lighter nuclei fuse together to form a heavy nucleus, then this process of fusion of nucleus is called nuclear fusion. In this process, the release of energy takes place.

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Example :- Fusion of two protons to form a duterium and a neutron is released.

$$_1^1H + _1^1H \longrightarrow _1^2H + \nu + 0.45\ MeV$$

→ **Nuclear Fission :-**

When a heavy nucleus after gaining some energy breaks into two lighter nuclei of comparable masses, then this process is called nuclear fission. In this, hazardous products are formed.

Example :-

$$_{92}^{235}U + _0^1n \longrightarrow _{92}^{236}U \longrightarrow _{36}^{91}Ba + _{36}^{122}Kr + 3_0^1n + 200\ MeV$$

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Answer of Que. no. 19 (OR)

Given :- $C_1 = 3pF = 3 \times 10^{-12} F$.

$C_2 = 4pF = 4 \times 10^{-12} F$.

$C_3 = 5pF = 5 \times 10^{-12} F$.

$V = 120 V$.

Total capacitance,

$C = C_1 + C_2 + C_3$

$C = 3 + 4 + 5$

$C = 12 pF$.

$\boxed{C = 12 pF}$ Ans.

Charge on each capacitor,

$Q_1 = C_1 V = 3 \times 10^{-12} \times 120 = 360 \times 10^{-12} = 3.6 \times 10^{-10} C$

$Q_2 = C_2 V = 4 \times 10^{-12} \times 120 = 480 \times 10^{-12} = 4.8 \times 10^{-10} C$.

$Q_3 = C_3 V = 5 \times 10^{-12} \times 120 = 600 \times 10^{-12} = 6 \times 10^{-10} C$.

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$\therefore$ $\boxed{Q_1 = 3.6 \times 10^{-10}\ C}$ Ans.

$\boxed{Q_2 = 4.8 \times 10^{-10}\ C}$ Ans.

$\boxed{Q_3 = 6 \times 10^{-10}\ C}$ Ans.

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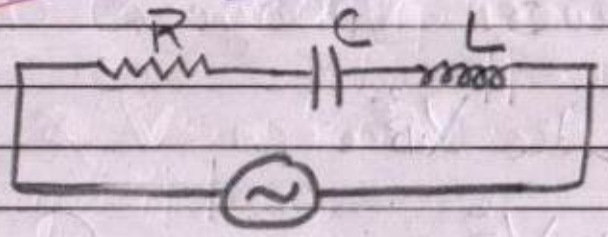
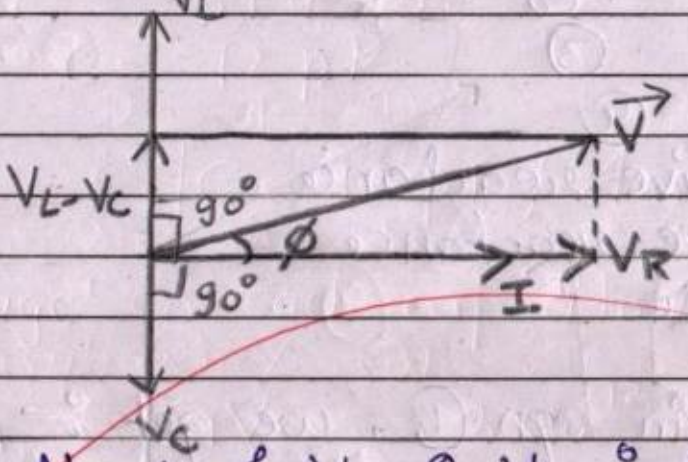
Answer of Que. no. 20 (OR)

Series LCR circuit :-



Let us consider a circuit in which resistance R, inductor L and capacitor C are connected in series.

Phasor diagram :-



Here, ~~induct~~ V_L leads current by 90°, V_C lags current by 90° and V_R and current are in same phase.

∴ Phase ~~displacement~~ difference between V_L & V_C = 180°.

Resultant of V_L & V_C is $(V_L - V_C)$.

The resultant of V_L, V_C & V_R can be given by V.

now,

V and I have phase difference ϕ.

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Resultant voltage :-

In the phase diagram, resultant V can be given as :-

$$V^2 = (V_L - V_C)^2 + V_R^2$$

$$V = \sqrt{(V_L - V_C)^2 + V_R^2} \quad \text{——— (1)}$$

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But $V_R = IR$ ——— (2)

$V_L = IX_L$ ——— (3)

$V_C = IX_C$ ——— (4)

where X_L = inductive reactance,

V_C = capacitive reactance,

R = resistance.

Putting these values in eqn (1), we get :-

$$V = \sqrt{(IX_L - IX_C)^2 + (IR)^2}$$

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

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$$V = I\sqrt{(X_L - X_C)^2 + R^2} \quad \text{---(5)}$$

Also, $X_L = \omega L$

$X_C = \frac{1}{\omega C}$

$$\therefore V = I\sqrt{\left(\omega L - \frac{1}{\omega C}\right)^2 + R^2} \quad \text{---(6)}$$

Eqns (5) & (6) are the resultant voltage equations

~~Resultant~~ Impedence :-

From eqn (5) :-

$$\frac{V}{I} = \sqrt{(X_L - X_C)^2 + R^2}$$

$$\therefore Z = \sqrt{(X_L - X_C)^2 + R^2} \quad \text{---(7)}$$

or $$Z = \sqrt{\left[\omega L - \frac{1}{\omega C}\right]^2 + R^2} \quad \text{---(8)}$$

$\frac{V}{I}$ = Total resistance or impedence of the LCR circuit

$\therefore \frac{V}{I} = Z$ = impedence

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Eqns (7) & (8) are the eqns for impedence of series LCR circuit.

Phase Difference between voltage & current :-

Let the phase difference between V & I be ϕ.

Then,

$$\tan\phi = \frac{V_L - V_C}{V_R} = \frac{IX_L - IX_C}{IR} = \frac{I(X_L - X_C)}{IR}$$

(From eqns (2), (3) & (4))

$$\tan\phi = \frac{X_L - X_C}{R}$$

$$\boxed{\phi = \tan^{-1}\left[\frac{X_L - X_C}{R}\right]} \quad \text{— (9)}$$

Incomplete

Incomplete. Not proper done

This is the expression for phase difference blw voltage & current.