वर्ष-202

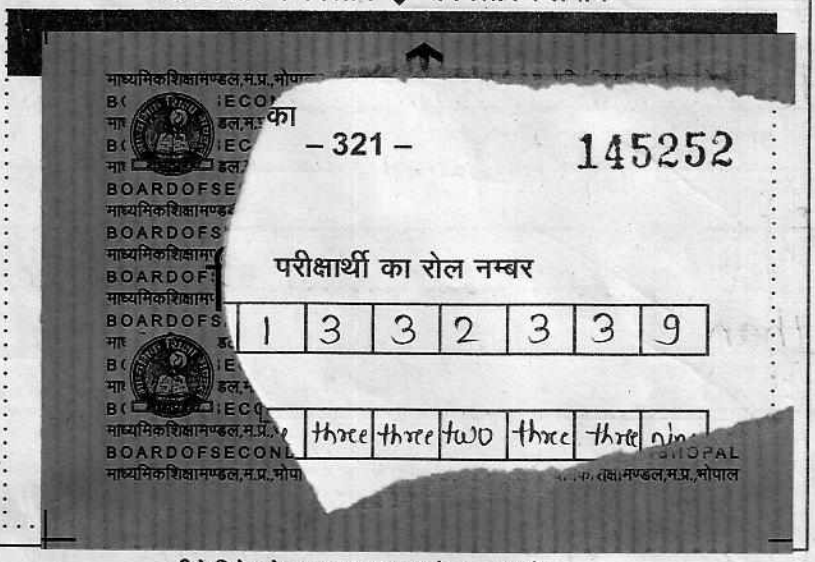
माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

परीक्षार्थी द्वारा भरा जायें ↓

24 पृष्ठीय

परीक्षा का विषय	विषय कोड			परीक्षा का माध्यम
PHYSICS	2	1	0	ENGLISH

स्टीकर तीर के निशान ↓ से मिलाकर लगायें



नीचे दिये गये उदाहरण अनुसार रोल नम्बर भरें।

उदाहरणार्थ	1	1	2	4	3	9	5	6	8
	एक	एक	दो	चार	तीन	नौ	पाँच	छः	आठ

क – पूरक उत्तर पुस्तिकाओं की संख्या अंको में 6 शब्दों में 6

ख – परीक्षार्थी का कक्ष क्रमांक GALLERY

ग – परीक्षा की दिनांक 21 02 2022

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

हायर सेकेण्डरी परीक्षा

केन्द्र क्रमांक-132080

पर्यवेक्षक का नाम एवं हस्ताक्षर	केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष के हस्ताक्षर
Pandya	

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जायें ↓

प्रमाणित किया जाता है कि मूल्यांकन के समय पूरक उत्तर पुस्तिकाओं की संख्या उपरोक्तनुसार सही पाई होलो क्राफ्ट स्टीकर क्षतिग्रस्त नहीं पाया गया अन्दर के **पृष्ठों के अनुरुप मुख्य पृष्ठ पर अंकों की प्रविष्टी अंकों का योग सही है।**

निर्धारित मुद्रा : नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं पदाकिंत संस्था के नाम की मुद्रा लगाएं।

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा	परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा
ASHISH PANDYA 71V5558	JUGAL KISHORE NAMDEO 71V5296

नोट :– ''हायर सेकेन्डरी परीक्षा में केवल वाणिज्य संकाय के विषयों तथा हाईस्कूल परीक्षा में प्रायोगिक विषय को छोड़कर शेष विषयों हेतु नियमित एवं स्वाध्यायी छात्रों के लिये प्रश्न पत्र 100 अंकों का होगा किन्तु नियमित छात्रों को 100 अंक के प्राप्तांक का 80' स्वाध्यायी छात्रों को 100 अंक के प्राप्तांक ही अंकसूची में प्रदर्शित किये जायें

केवल परीक्षक द्वारा भरा जायें

प्रश्न क्रमांक के सम्मुख प्राप्ताकों की प्रविष्ठी करें

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्ताक (अंको में)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
कुल प्राप्तांक शब्दों में		कुल प्राप्तांक अंकों में

विशेष नोट :– सिलाई खुली हुई अथवा क्षतिग्रस्त उत्तर पुस्तिका को न तो पर्यवेक्षक वितरण करे और न ही छात्र उपयोग में ले। ऐसी उत्तर पुस्तिका में लिखे उत्तरों का मूल्यांकन नहीं किया जायेगा। परीक्षार्थी द्वारा भरा जायें → केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष एवं पर्यवेक्षक द्वारा भरा जायें → परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जायें →

प्रश्न क्र.

Question-1

(a) Zener diode

(b) Copper wire

(c) is more than

(d) 1.6×10^{-19} C

(e) the length of coil

(f) Mutual induction

an accelerated charge

Question-2

(i) h/p

(ii) bar magnet

(iii) Wheat stone bridge

(iv) Concave

(v) $y = \overline{A \cdot B}$

(vi) scattering of light

प्रश्न क्र.

(vii) parallel

Question-3

(i) Magnifying power of compound microscope $\Rightarrow \frac{-V_o}{u_o}\left(1+\frac{D}{f_e}\right)$

(ii) Brewester's Law ⇒ Polarisation of light

(iii) Infrared radiation ⇒ Hershel

(iv) Electron volt ⇒ Unit of energy

(v) Dynamo ⇒ Electromagnetic induction

(vi) Ammeter ⇒ Instrument of measuring current.

(vii) Electrical power ⇒ V.I.

Question-4

(i) Power of lens = $\frac{1}{\text{focal length (in m)}}$

(ii) NOT gate is known as inversion gate.

(iii) Lenz's law is based on law of conservation of energy.

प्रश्न क्र.

(iv) The minimum frequency required to eject the electron from metal surface is called Threshold frequency.

(v) The magnification power of Astronomical telescope can be increased by decreasing the focal length of objective. ✗

(vi) The potential decrease due to insulated medium.

(vii) Time varying Electric field is the reason for origin of displacement current.

प्रश्न क्र.

Question-5

Two limitation of Ohm's law -

(i) It applies only when there is no change in physical condition of conductor.

(ii) It does not work with non-ohmic conductors (Diode, water voltmeter etc.)

Question-6

Lorentz force ⇒ The force act on a charged particle when it enters in a magnetic field, is called as lorentz force. It is given by -

$$F = qVB \sin\theta$$

SI unit = Newton
CGS unit = Dyne

P.T.O.

प्रश्न क्र.

Question-1

Given,
Polarising angle, $i_p = 30^\circ$

We know that

$\mu = \tan i_p$

$\mu = \tan 30^\circ$

$\mu = \frac{1}{\sqrt{3}}$

Question-7 OR

Given,
Diameter of objective lens of telescope = 1 metre

Wavelength, $\lambda = 4538\ \text{Å}$ or $4538 \times 10^{-10}\ m$

Resolving power $= \frac{d}{1.22\lambda}$

$= \frac{1}{4538 \times 10^{-10}}$

$= 2.2 \times 10^6$

प्रश्न क्र.

Question 6

Faraday's second law of electromagnetic induction ⇒ It states that the induced emf is directly proportional to rate of change of magnetic flux. It is given as-

$$e = \frac{-d\phi}{dt}$$

If there are N no. of turns.

$$e = \frac{-N d\phi}{dt}$$

Here negative sign shows that it (emf) opposes the changes of magnetic flux.

प्रश्न क्र.

Question-7

We know that

$\phi = \oint E\,ds\cos\theta$ [angle b/w area vector and $\vec{E}$ is zero $\therefore \cos 0^\circ = 1$]

$\phi = E\oint ds$

$\phi = E(s)$ — ①

According to Gauss's theorem-

$\phi = \frac{1}{\varepsilon_0}\cdot q$ — ②

From ① and ②

$E(s) = \frac{1}{\varepsilon_0} q$

$\because$ there is no charge inside conductor

$\therefore E = 0$

⇒ Electric field inside the conductor is zero [0 N/C]

We know that

$E = -\frac{dV}{dx}$

$\because E = 0$

⇒ $\therefore$ potential is constant inside a charged conductor.

प्रश्न क्र.

Question 10

The Red colour has maximum wavelength Since scattering is inversely proportional to fourth power of wavelength, so it scatters least and it can travel to very long distance. Therefore it is used for danger signals.

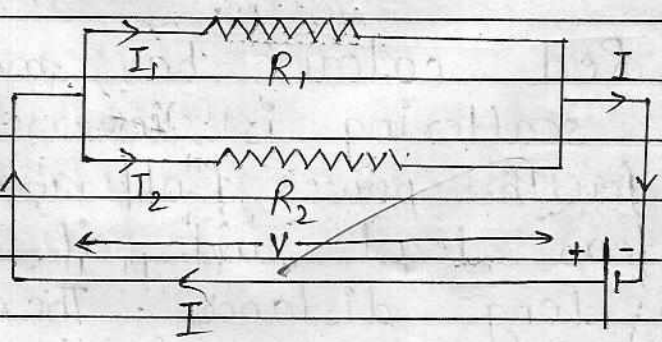
Question - 11

Stopping potential ⇒ The minimum potential required to stop to emit the photoelectrons from metal surface and also stop photocurrent is called as stopping potential.

Question - 12 OR

	N-type semiconductor	P-type semiconductor
1.	They are obtained by adding impurity of pentavalent atoms (eg. Arsenic) to silicon or germanium.	1. They are obtained by adding impurity of trivalent atoms (eg. Indium) to Silicon or germanium.
	The majority charge carriers are electrons.	2. The majority charge carriers are holes.

प्रश्न क्र.



Consider two resistors of resistance R_1 and R_2. In parallel combination the potential (V) is same but the current is distributed into I_1 and I_2.

$$I = I_1 + I_2 \qquad \left[\because I = \frac{V}{R}\right]$$

$$\frac{V}{R_{eq}} = \frac{V}{R_1} + \frac{V}{R_2}$$

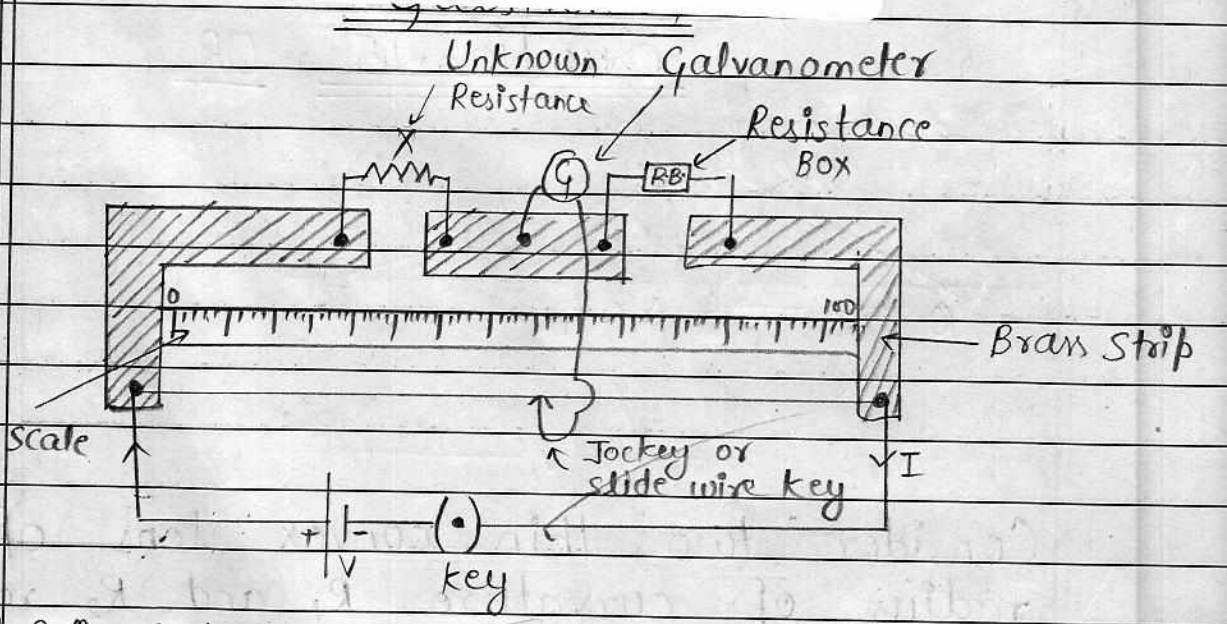
$$\therefore \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{eq}} = \frac{R_1 + R_2}{R_1 R_2}$$

$$\boxed{R_{eq} = \frac{R_1 R_2}{R_1 + R_2}}$$

This is the required expression of equivalent resistance.

प्रश्न क्र.



Principle ⇒ It works on the principle of wheat stone bridge.

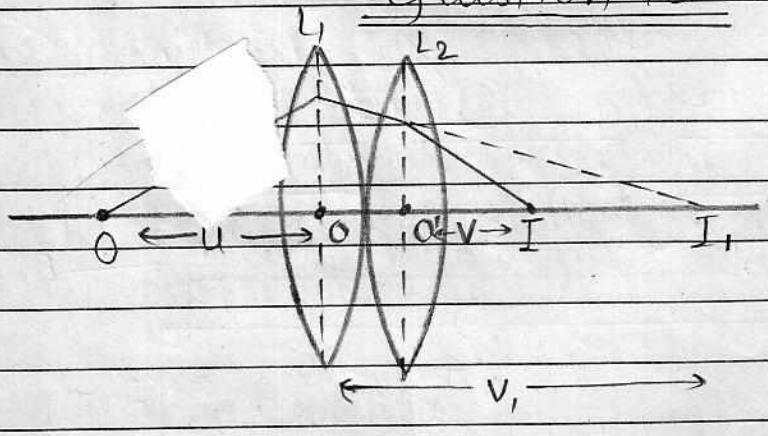
Precautions ⇒

(i) The current should not be flown for long time otherwise the bridge gets heated up and resistance will increase.

(ii) The jockey should not be rubbed over the wire otherwise the area will not remain uniform throughout.

प्रश्न क्र.

Question-15 OR



Consider two thin convex lens of radius of curvature R_1 and R_2 respectively. O is the position of object, I is the position of image

For lens 1 -

Consider that lens 2 is absent and not present.

By using lens's formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\therefore \frac{1}{f_1} = \frac{1}{V_1} - \frac{1}{u} \quad \text{—(1)}$$

[V_1 = image distance of L_1
u = object distance of L_1]

For lens 2 -

$$\frac{1}{f_2} = \frac{1}{v} - \frac{1}{V_1} \quad \text{—(2)}$$

प्रश्न क्र.

Adding eq. (1) and (2)

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v} - \frac{1}{u} + \frac{1}{v} - \frac{1}{v}$$

$$\frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v} - \frac{1}{u} \quad \text{— (3)}$$

If we consider an equivalent lens in place of both the lens of focal length f. then, by using lens's formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \quad \text{— (4)}$$

from eq. (3) and (4)

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\frac{1}{f} = \frac{f_1 + f_2}{f_1 f_2}$$

$$\boxed{f = \frac{f_1 f_2}{f_1 + f_2}} \quad \text{— (A)}$$

This is the required expression for combination lens.

प्रश्न क्र.

Question-16

Given that,

$\mathcal{E}_s = 440$ volt

$\mathcal{E}_p = 11000$ volt

$N_p = 8000$

$N_s = ?$

We know that

$$\frac{\mathcal{E}_s}{\mathcal{E}_p} = \frac{N_s}{N_p}$$

$$\frac{440}{11000/100} = \frac{N_s}{8000}$$

$$N_s = \frac{4 \times 8000}{100}$$

$$N_s = 320$$

There are 320 turns in secondary coil.

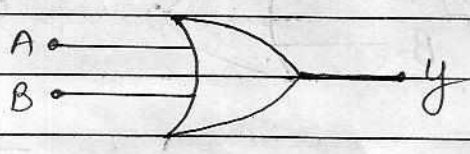
प्रश्न क्र.

Question-1+

Logic gates ⇒ Logic gates are the basic building block of electrical system. In it there are two or more than two inputs but there is only one output.

(i) **OR gate** ⇒

→ **Symbol** :-



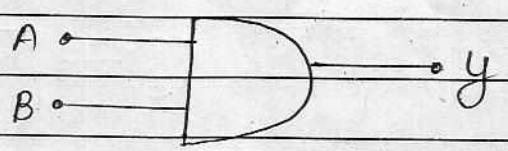
→ **Boolean formula** ⇒ $y = A + B$

→ **Truth table** ⇒

A	B	y = A + B
0	0	0
0	1	1
1	0	1
1	1	1

(ii) **AND gate** ⇒

→ **symbol** ⇒



→ **Boolean formula** ⇒ $y = A \cdot B$

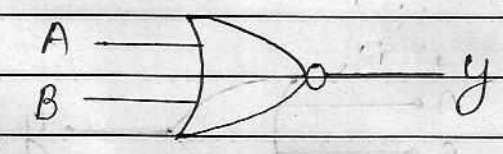
प्रश्न क्र.

→ Truth table ⇒

A	B	y = A·B
0	0	0
0	1	0
1	0	0
1	1	1

(iii) NOR gate ⇒

Symbol ⇒



Boolean formula ⇒ $y = \overline{A+B}$

Truth table ⇒

A	B	A+B	$y = \overline{A+B}$
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

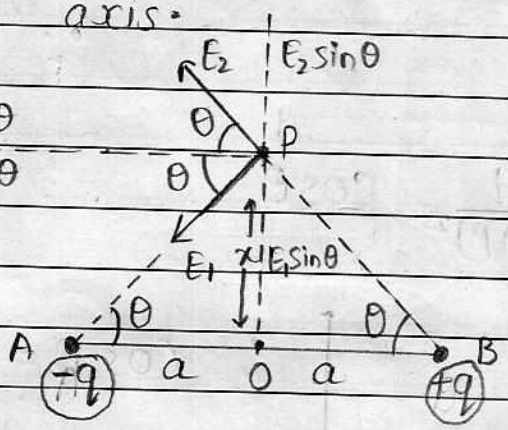
प्रश्न क्र.

Question-18 OR

(i) part

Electric dipole ⇒ Two equal and opposite charges separated by a small distance is called electric dipole. The line joining of both charges is called as dipole axis.

(ii) part



Consider an electric dipole AB having charges $-q$ and $+q$ respectively. We are to find electric field intensity at point P at any distance x from O.

Electric field intensity at point P due to charge $-q$

$$E_1 = \frac{1}{4\pi\varepsilon_0 K} \frac{q}{(AP)^2} \quad \text{— (1)}$$

Electric field intensity at point P due to charge $+q$

$$E_2 = \frac{1}{4\pi\varepsilon_0 K} \frac{q}{(BP)^2} \quad \text{— (2)}$$

प्रश्न क्र.

Net electric field, $E_{net} = E_1 \cos\theta + E_2 \cos\theta$

$$E_{net} = (E_1 + E_2)\cos\theta$$

$$E_{net} = \left[\frac{1}{4\pi\varepsilon_0 k}\frac{q}{(AP)^2} + \frac{1}{4\pi\varepsilon_0 k}\frac{q}{(BP)^2}\right]\cos\theta$$

$\because AP = BP$

$$E_{net} = \frac{2}{4\pi\varepsilon_0 k}\frac{q}{(AP)^2}\cos\theta$$

$\because \cos\theta = \frac{a}{AP}$

$AP = \sqrt{x^2+a^2}$

$\therefore \cos\theta = \frac{a}{\sqrt{x^2+a^2}}$

$$E_{net} = \frac{2}{4\pi\varepsilon_0 k}\frac{q}{(x^2+a^2)}\frac{a}{\sqrt{x^2+a^2}}$$

$$E_{net} = \frac{1}{4\pi\varepsilon_0 k}\frac{q(2a)}{(x^2+a^2)^{3/2}}$$

$[\because P = q \times 2a]$

$$E_{net} = \frac{1}{4\pi\varepsilon_0 k}\frac{P}{(x^2+a^2)^{3/2}} \text{ N/C} \quad \text{—— (A)}$$

प्रश्न क्र.

if $x \ll a$ then $x^2 + a^2 \approx x^2$

$$E_{net} = \frac{1}{4\pi\varepsilon_0 k} \frac{P}{(x^2)^{3/2}}$$

$$E_{net} = \frac{1}{4\pi\varepsilon_0 k} \frac{P}{x^3} \text{ N/C} \quad \text{— (B)}$$

for air or vaccum, $k = 1$

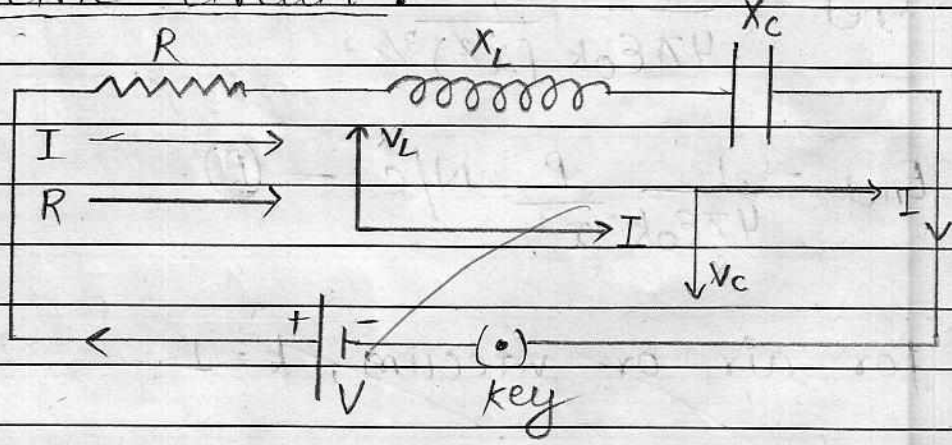
$$E_{net} = \frac{1}{4\pi\varepsilon_0} \frac{P}{x^3} \text{ N/C} \quad \text{— (C)}$$

(A) (B) (C) represent different form of electric field intensity for equatorial position.

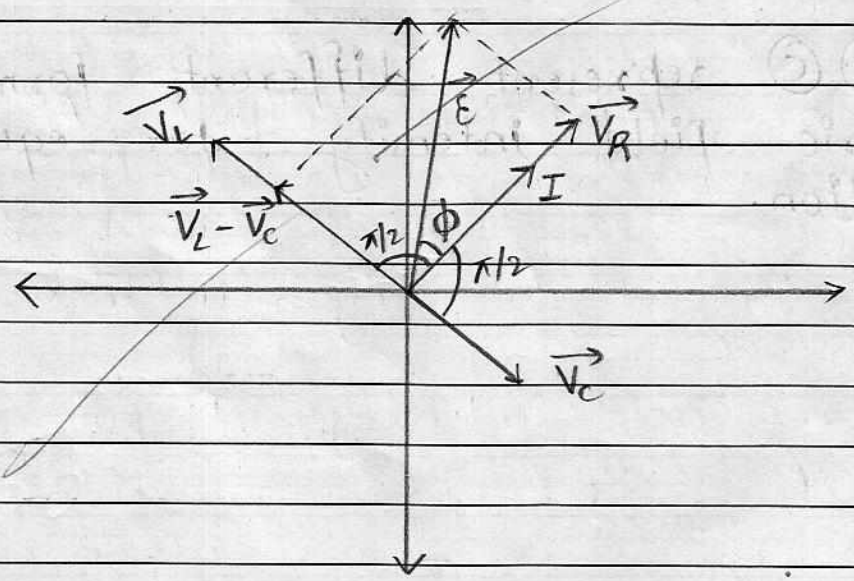
प्रश्न क्र.

Question-19

(i) **Electric circuit :-**



(ii) **Phasor diagram :-**



(iii) **Resultant Voltage –**

If $\vec{E}$ is the resultant of $\vec{V_L} - \vec{V_C}$ and $\vec{V_R}$

$\therefore R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$

प्रश्न क्र.

$$|\vec{\mathcal{E}}| = \sqrt{|\vec{V_L} - \vec{V_C}|^2 + |\vec{V_R}|^2 + 2|\vec{V_L} - \vec{V_C}||\vec{V_R}| \cos 90^\circ}$$

$$[\because \cos 90^\circ = 0]$$

$$|\vec{\mathcal{E}}| = \sqrt{|\vec{V_L} - \vec{V_C}|^2 + |\vec{V_R}|^2} \quad \longrightarrow (1)$$

$\therefore$

$$\rightarrow |\vec{V_L} - \vec{V_C}| = \sqrt{|\vec{V_L}|^2 + |\vec{V_C}|^2 + 2|\vec{V_L}||\vec{V_C}| \cos 180^\circ}$$

$$|\vec{V_L} - \vec{V_C}| = \sqrt{|\vec{V_L}|^2 + |\vec{V_C}|^2 - 2|\vec{V_L}||\vec{V_C}|}$$

$$|\vec{V_L} - \vec{V_C}| = \left[|\vec{V_L}| - |\vec{V_C}|\right]^{2 \times \frac{1}{2}}$$

$$|\vec{V_L} - \vec{V_C}| = V_0^L - V_0^C$$

& Put in (1)

$$|\vec{\mathcal{E}}| = \sqrt{(V_0^L - V_0^C)^2 + (V_0^R)^2}$$

$$|\vec{\mathcal{E}}| = \sqrt{(I_0 X_L - I_0 X_C)^2 + (I_0 R)^2}$$

$$|\vec{\mathcal{E}}| = \sqrt{I_0^2 \left[(X_L - X_C)^2 + R^2\right]}$$

$$\boxed{|\vec{\mathcal{E}}| = I_0 \sqrt{R^2 + (X_L - X_C)^2}}$$

(iv) Impedance -

$$\mathcal{E}_0 = I_0 \sqrt{R^2 + (X_L - X_C)^2}$$

$$\frac{\mathcal{E}_0}{I_0} = \sqrt{R^2 + (X_L - X_C)^2}$$

याग पूव पृष्ठ पृष्ठ 22 क अक कुल अक

प्रश्न क्र.

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

(v) Phase difference —

$$\tan\phi = \frac{V_0^L - V_0^C}{V_R^0}$$

$$\tan\phi = \frac{I_0 X_L - I_0 X_C}{I_0 R}$$

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

$$\phi = \tan^{-1}\left(\frac{X_L - X_C}{R}\right)$$