24/19

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

2017

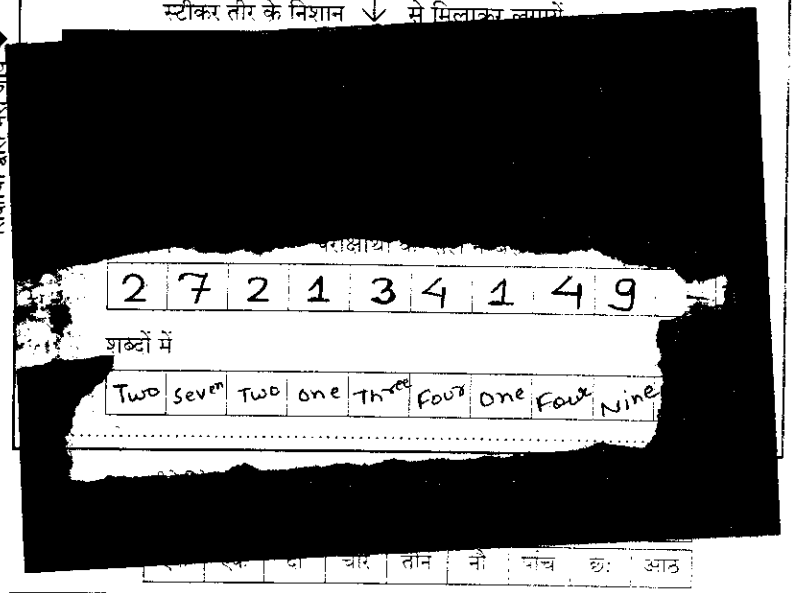
24 पृष्ठीय

परीक्षार्थी द्वारा भरा जावे ↓

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

स्टीकर तीर के निशान ↓ से मिलाकर लगायें

परीक्षार्थी द्वारा भरा जावे →



2 7 2 1 3 4 1 4 9

शब्दों में

Two Seven Two one Three Four one Four Nine

केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष एवं पर्यवेक्षक द्वारा भरा जावे →

क – पूरक उत्तर पुस्तिकाओं की संख्या अंकों में 02 शब्दों में दो

ख – परीक्षार्थी का कक्ष क्रमांक 13

ग – परीक्षा का दिनांक 11 03 2017

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

हायर सेकेण्डरी सर्टी० परीक्षा केन्द्र क्रमांक-21202?

पर्यवेक्षक का नाम एवं हस्ताक्षर	केन्द्राध्यक्ष/सहायक केन्द्राध्यक्ष के हस्ताक्षर
शशि कुमारी	

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे →

प्रमाणित किया जाता है कि मूल्यांकन के समय पूरक उत्तर पुस्तिकाओं की संख्या उपरोक्तानुसार सही पाई होलो क्राफ्ट स्टीकर क्षतिग्रस्त नहीं पाया गया तथा अंकों 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 पदांकित संस्था के नाम की मुद्रा लगाएं।

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा	परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा
M. L. Parihar 2540175	AMJAD KHAN 041732

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

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

कुल प्राप्तांक शब्दों में	कुल प्राप्तांक अंकों में
Seven Three	73

प्रश्न क्र.

Q.1.

(a) (iv) Photo Diode

(b) (iii) $\frac{\Delta I_c}{\Delta I_b}$

(c) (i) 1.32×10^{-27} kg x meter/sec

(d) (iii) Insulator

(e) (ii) 9 km

$\lambda = 5000 A^\circ$

5000×10^{-10}

5×10^{-7} m

$\lambda = \frac{h}{p}$

$p = \frac{h}{\lambda}$

$\frac{6.626 \times 10^{-34}}{5 \times 10^{-7}}$

5) 6626

5

16

15

20

20

26

1.32×10^{-27}

Q.2

(a) $\frac{1}{\epsilon_0}$

(b) 9.1×10^{-31} kg

(c) 0 - zero

(d) 0 - zero

(e) negative

$C = 4\pi\epsilon_0 R$

$10^{-6} = \frac{1}{9 \times 10^9} \times R$

$9 \times 10^3 = R$

$9000 m = R$

$6400 km = R$

$C \rightarrow \frac{6400 \times 10^3}{9 \times 10^9}$

$p = \frac{h}{\lambda}$

$\frac{6.626 \times 10^{-34}}{5 \times 10^{-7}}$

1.32×10^{-27}

Q. 3

	Column "A"	Column "B"
(a)	Potential energy of electric dipole	$-PE\cos\theta$
(b)	Ultraviolet rays	As germs killer
(c)	Infrared rays	In photography in dark.
(d)	Intensity of magnetic field at the centre of current carrying solenoid	$\mu_0 n I$
(e)	Intensity of magnetic field at the one end of current carrying solenoid	$\frac{\mu_0 n I}{2}$

(f) Continuous spectrum

(g) NOR gate

(h) To reduce the loss of current by heating because of eddy current. (Iron loss)

प्रश्न क्र.

(d) Simple microscope

(e) Resolving power of microscope ~~is~~ is inversely proportional to the wavelength used.

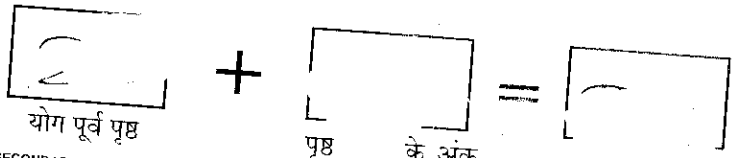
$R.P \propto \frac{1}{\lambda}$

Ans ⇒ 5

The two conditions for two optical sources to become coherent source are

1. The two coherent sources must be very near to each other. so that the light given them by has ~~zet~~ zero phase difference or constant phase difference

2. The two sources must be very small such that the light rays must have same frequency.



Ans → 6.

Or

Conjugate focci are the two points on the principal axis such that the position of object and image can be interchanged.

Image of first object is formed on second point and image of second point object is formed on first point.

Ans → 7.

The two laws of photo electric effect are -

(1) Whenever light falls on metal object electrons are emitted. The ~~intensity of~~ the number of electrons emitted per second or photo electric current is directly proportional to intensity of incident light.

(2) The Kinetic energy or the velocity of emitted electrons is directly proportional to the frequency of the incident light. It must have atleast threshold frequency to emit electrons.

Ans → 8 or

Laser rays

(i) Laser rays are very intense and monodirectional.

(ii) Laser rays are highly coherent and unidirectional.

Ans → 9

If length of a conducting wire becomes twice, when ~~strength~~ stretched.

On stretching, volume never changes.

∴ Initial Volume = Final volume.

Let the length of initial conductor = l_1,
Final length of conducting wire = $l_2 = 2l_1$
Let radius of initial conductor = r_1,
radius of final conductor = r_2

Let Resistance of initial conductor = R_1,
and Resistance of final conductor = R_2
Area of initial wire = A_1,
Area of crossection of ~~wi~~ final wire = A_2

Initial Volume = Final Volume

$$l_1 A_1 = l_2 A_2$$

$$l_1 \pi r_1^2 = l_2 \pi r_2^2$$

$$\frac{l_1}{l_2} = \frac{\pi r_2^2}{\pi r_1^2}$$

$$\frac{l_1}{l_2} = \left(\frac{r_2}{r_1}\right)^2 \quad \text{— (i)}$$

Now $\frac{R_1}{R_2} = \frac{\rho \frac{l_1}{A_1}}{\rho \frac{l_2}{A_2}}$

$$\Rightarrow \frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{A_2}{A_1}$$

$$\frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{\pi r_2^2}{\pi r_1^2}$$

$$\frac{R_1}{R_2} = \frac{l_1}{l_2} \times \left(\frac{r_2}{r_1}\right)^2$$

Putting the value of $\left(\frac{r_2}{r_1}\right)^2$ from (i)

$$\frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{l_1}{l_2}$$

$$\frac{R_1}{R_2} = \left(\frac{l_1}{l_2}\right)^2$$

$$\therefore \frac{R_1}{R_2} = \left(\frac{l_1}{2l_1}\right)^2 = \frac{1}{4}$$

$$\therefore R_2 = 4R_1$$

Hence resistance will becomes 4 times

Ans ⇒ 10. Or

Super conductor :→ When the temperature of conductor is reduced its resistivity also reduce and conductivity increases. At a particular temperature resistance becomes Zero(0). and conductance becomes infinite. At that time conductor behaves as super conductor.

Uses

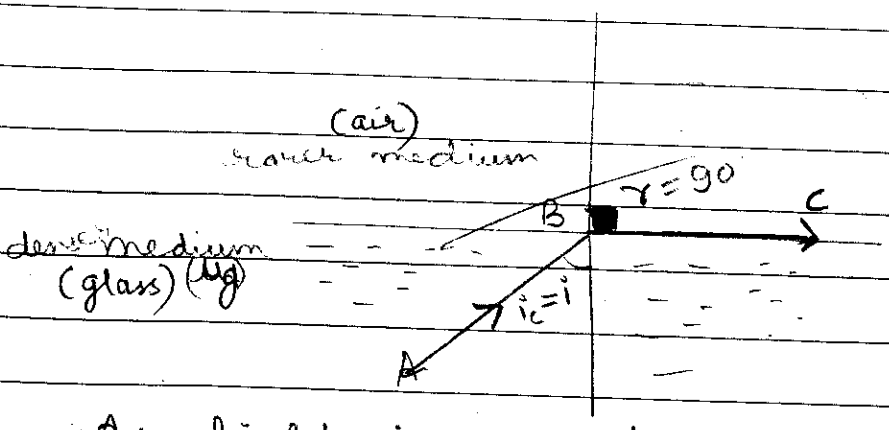
(1) It is used to make high speed computer.

(2) It is used to transmit signals/electricity with speed.

Ans ⇒ 11

Relation between critical angle and refractive index of medium.

When the ray travels from denser medium to rarer medium at a particular angle of incidence, the angle of refraction becomes 90°. Then ~~then~~ that incident angle is called ~~c~~ angle of incidence.



As light is going from denser medium to rarer medium.

Refractive index of air with respect to medium (denser) = $_g\mu_a$

By snell's law

$$_g\mu_a = \frac{\sin i}{\sin r}$$

When $i = i_c$, $r = 90^\circ$

$$_g\mu_a = \frac{\sin i_c}{\sin 90^\circ}$$

$$_g\mu_a = \sin i_c$$

$$\Rightarrow \frac{1}{a\mu g} = \sin i_c$$

$$\Rightarrow \boxed{a\mu g = \frac{1}{\sin i_c}}$$

Or

$$\mu = \frac{1}{\sin i_c}$$

where μ is refractive index of medium.

प्रश्न क्र.

Ans ⇒ 12.

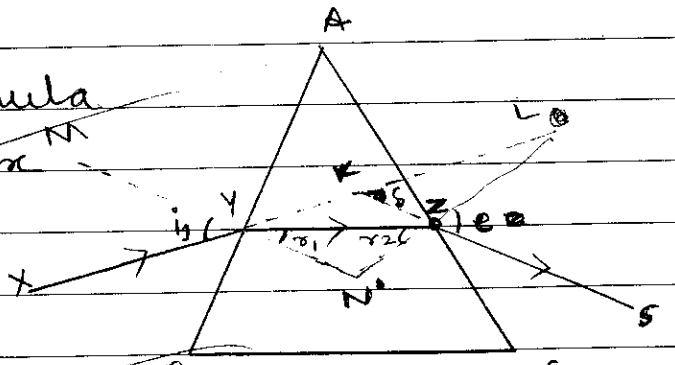
Any lens when dipped inside the liquid, then its focal length increases.

For reasons:

Consider a medium whose refract

Ans ⇒ 12.

To deduce the formula of refractive index of material of prism.



Consider a prism of refractive index μ. XY is incident ray. YZ is refracted and ZS is emergent ray.
Angle of prism is A. Angle of incidence = i
Angles of refraction = r_1, r_2. Angle of emergence = e_1.
Angle of deviation = ∠LKS = δ

In $\triangle KYZ$, by exterior angle,

$$\angle LKS = \angle KYZ + \angle KZY$$

$$\delta = i - r_1 + e - r_2$$

$$\delta = i + e - (r_1 + r_2) \quad -(i)$$

In the condition of minimum deviation.

$$\delta = \delta_m, \quad i = e, \quad r_1 = r_2 = r$$

$$\Rightarrow \delta_m = i + i - 2r$$

$$\delta_m = 2i - 2r$$

$$2i = \delta_m + 2r$$

$$\boxed{i = \frac{\delta_m + 2r}{2}} \quad -(ii)$$

In $\triangle YNZ$

$$r_1 + r_2 + \angle YNZ = 180^\circ \quad -(iv)$$

In quadilateral, AYNZ.

$$A + \angle YNZ + 90^\circ + 90^\circ = 360^\circ$$

$$A + \angle YNZ = 180^\circ \quad -(v)$$

from (iv) and (v)

$$r_1 + r_2 + \angle YNZ = A + \angle YNZ$$

$$r_1 + r_2 = A$$

But $r_1 = r_2 = r$

$$2r = A$$

$$\boxed{r = A/2} \quad -(vi)$$

By snell's law

$$\mu = \frac{\sin i}{\sin r}$$

$$\Rightarrow \mu = \frac{\sin\left(\frac{\delta m + 2r}{2}\right)}{\sin A/2}$$

But $2r = A$

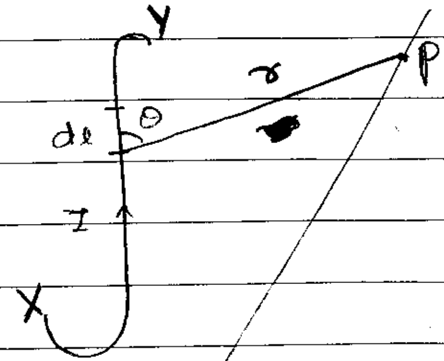
$$\Rightarrow \boxed{\mu = \frac{\sin\left(\frac{A + \delta m}{2}\right)}{\sin A/2}}$$

This is the formula for refractive index of material of prism.

Ans ⇒ 13

Biot - Severt Law :- Biot severt gave a law to find the intensity of magnetic field near a straight long current carrying conductor.

Consider a long wire (XY) carrying current I. A small element dl is chosen. P is a point on which magnetic field is to be found which is at a distance r.



We know that,
magnetic field intensity (dB) is

(I) directly proportional to the current (I) such that $dB \propto I$.

(II) directly proportional to line element (dl) such that $dB \propto dl$

(III) directly proportional to sin θ such that $dB \propto \sin\theta$
where θ is angle between dl and r.

(IV) & inversely proportional to square of distance (r) such that
$$dB \propto \frac{1}{r^2}$$

Combining all,

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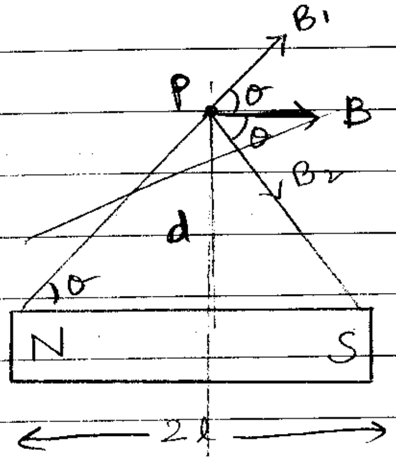
Ans ⇒ 13.

To derive the expression of resultant intensity of magnetic field at a point which is equidistance from poles of a small bar magnet.



Consider a magnet N.S whose length is 2l. We have to find magnetic field at the point (P) which is equidistante from poles.

∴ NP = PS.

magnetic field at point P due to north pole = B_1

$$B_1 = \frac{\mu_0}{4\pi} \frac{m}{(NP)^2} \quad -(1)$$

$$B_1 = \frac{\mu_0}{4\pi} \frac{m}{(d^2+l^2)}$$

Magnetic field at point P due to south pole = B_2.

$$B_2 = \frac{\mu_0}{4\pi}\frac{m}{(SP)^2} \quad - (ii)$$

B_1 and B_2 are making 2θ with each other.

$$\therefore \quad B = \sqrt{B_1^2 + B_2^2 + 2B_1B_2\cos 2\theta}$$

But since $NP = PS$

$$B_1 = B_2$$

$$B = \sqrt{B_1^2 + B_1^2 + 2B_1^2\cos 2\theta}$$

$$B = \sqrt{2B_1^2(1+\cos 2\theta)}$$

$$B = \sqrt{2B_1^2 \times 2\cos^2\theta}$$

$$B = \sqrt{2B_1^2 \times 2\cos^2\theta}$$

$$B = 2B_1\cos\theta$$

$$B = 2 \times \frac{\mu_0}{4\pi}\frac{m}{(d^2+l^2)} \cdot \frac{l}{\sqrt{d^2+l^2}}$$

$$\boxed{B = \frac{\mu_0}{4\pi}\frac{2ml}{(d^2+l^2)^{3/2}}}$$

प्रश्न क्र.

$$B = \frac{\mu_0}{4\pi} \frac{M}{(d^2 + l^2)^{3/2}}$$

for small magnet, $l << d$

neglecting l^2, we get

$$B = \frac{\mu_0}{4\pi} \frac{M}{d^3}$$

This is the required expression.

Ans ⇒ 14.

To prove $I_{RMS} = \frac{I_0}{\sqrt{2}}$

I_{RMS} means Root mean square value of current which is equal to $\frac{I_0}{\sqrt{2}}$.

We know that

$$I_{RMS} = \frac{\sqrt{\int_0^T I^2 \, dt}}{T}$$

Squaring both side

$$I^2_{Rms} = \frac{1}{T}\int_0^T I^2\,dt$$

But $I = I_0 \sin \omega t$

$$I^2_{Rms} = \frac{1}{T}\int_0^T I_0^2 \sin^2 \omega t\,dt$$

$$I^2_{Rms} = \frac{1}{T}\int_0^T I_0^2 \left(\frac{1-\cos 2\omega t}{2}\right) dt$$

$$I^2_{Rms} = \frac{1}{T}\left[\int_0^T \frac{I_0^2}{2}\,dt - \int_0^T \frac{I_0^2}{2}\cos 2\omega t\,dt\right]$$

$$I^2_{Rms} = \frac{1}{T}\left[\int_0^T \frac{I_0^2}{2}\,dt - \frac{I_0^2}{2}\int_0^T \cos 2\omega t\,dt\right]$$

$\because \int_0^T \cos 2\omega t = 0$

$$I^2_{Rms} = \frac{1}{T}\left[\frac{I_0^2}{2}(t)_0^T - 0\right]$$

$$I^2_{Rms} = \frac{1}{T}\left[\frac{I_0^2}{2}[T-0]\right]$$

$$I^2_{Rms} = \frac{I_0^2}{2} \times \frac{1}{T}$$

$$I^2_{Rms} = \frac{I_0^2}{2}$$

Taking square root

$$\boxed{I_{Rms} = \frac{I_0}{\sqrt{2}}}$$

This is the required result.

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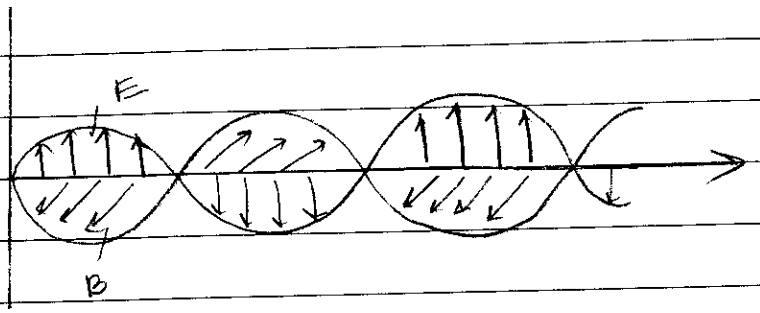
Ans ⇒ 15.

Electromagnetic waves :- The waves which consist of electric field intensity and magnetic field intensity in mutually perpendicular direction and also both the fields are perpendicular to the direction of wave propagation.



Characteristics

(1) These EM waves are neutral. These are not affected by electric and magnetic fields

(2) These waves carry energy

(3) They travel with the speed of light i.e 3×10^8 m/s

A) These waves carry energy.

) The EM waves are produced are oscillating and accelerating charge particle.

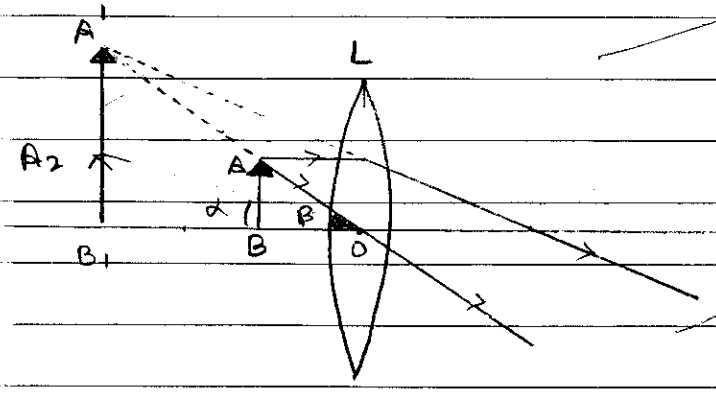
) The speed of the wave is given by $c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$.

Ans = 16.

Or

Simple Microscope

It is a single convex lens of less focal length which is attached with a plastic handle. It is also called reading lens.



L = convex lens
AB = object
A_1B_1 = image
A_2B_1 = object at D distance

नं क्र.

Magnifying power :- The ratio of visual angle made by image to the visual angle made by object kept at distance D is called magnifying power. Here visual angle made by image = β, visual angle made by object at Distance D is α. Here D is least distance.

$$m = \frac{\beta}{\alpha}$$

If α, and β are small angle then

$\alpha = \tan\alpha$, and $\beta = \tan\beta$

then $m = \frac{\tan\beta}{\tan\alpha}$

In $\triangle OAB$,

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

and In $\triangle OA_2B_1$

$\tan\alpha = \frac{A_2B_1}{OB_1} =$

$m = \frac{\tan\beta}{\tan\alpha} = \frac{AB}{OB} \times \frac{OB_1}{A_2B_1}$

But $AB = A_2B_1$

and $OB = -u$

and $OB_1 = -D$

$\therefore \quad m = \frac{OB_1}{OB}$

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

$$\boxed{m = \frac{D}{u}}$$

When ~~fin~~ image is formed at least distance of distinct vision.

$v = -D, \quad u = -u, \quad f = f$

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

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

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

$\Rightarrow \frac{D}{u} = \frac{D}{f} + 1$

But $\frac{D}{u} = m$

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

~~This is~~ the required expression when image is formed at distance D.

क्र.

Ans ⇒ 17.

Communication system

The communication is the process of transmission of information from one place to another. We use many elements to transfer the information. The system of these elements is called communication system.

The main parts of it are -

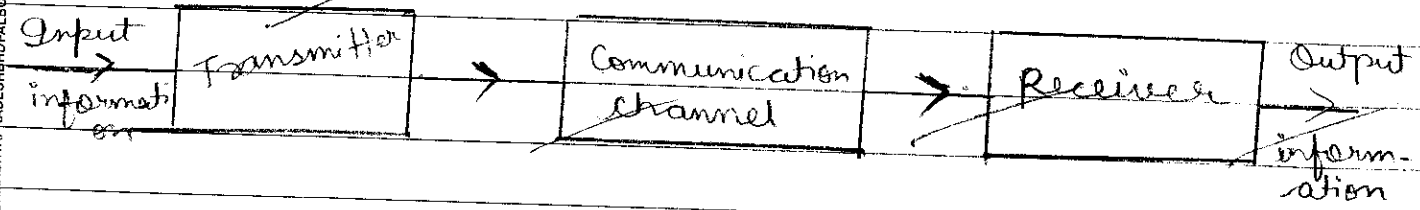
1. Transmitter
2. Communication channel
3. Receiver

Transmitter :- Its function is to transmit information. It transmits the information by converting the analog form of information.

(2) Communication channel :- It is a physical medium in which the information travels. It is through this channel, the transmitter transmits the information and received by receiver.

(3) Receiver :- Its function is to receive the information in the required form with the help of receiving antenna.

These three parts are the main parts of communication system.



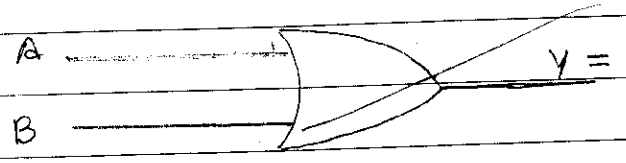
प्रश्न क्र.

Ans ⇒ 18.

OR gate

It has two input and one output.

Symbol :-



Boolean expression

If A, and B are two input then output $\boxed{Y = A + B}$

Truth table

A	B	Y = A + B
0	0	0
1	0	1
0	1	1
1	1	1

माध्यमिक शिक्षा म , मध्यप्रदे

परीक्षार्थी द्वारा भरा जावे ↓

परीक्षा का विषय	विषय कोड	परीक्षा का माध्यम	परीक्षा का दिनांक
Physics	2 1 0	English	11 03 2017

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[redacted]

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

हायर सेकेण्डरी सर्वी. परीक्षा

केन्द्र क्रमांक-212027

25

पर्यवेक्षक का नाम एवं हस्ताक्षर

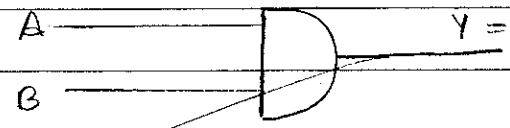
राजेन्द्र आर्य

केन्द्राध्यक्ष / सहायक केन्द्राध्यक्ष के हस्ताक्षर

उत्तर पुस्तिका के अंतिम पृष्ठ क्रमांक.....तक कुल प्राप्तांक ☐ + ☐ = ☐

AND Gate

Symbol



i) Boolean expression

If A and B are two input then Output $Y = A \cdot B$

ii) Truth table

A	B	A · B
0	0	0
1	0	0
0	1	0
1	1	1

प्रश्न क्र.

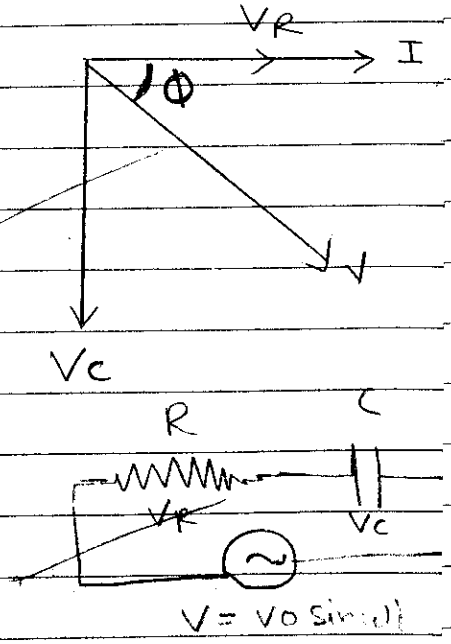
Ans ⇒ 19.

R - C circuit

When an A.C source is connected with a resistor of resistance R and condensor of capacitance C.

Yet at any time, the applied AC voltage is $V = V_0 \sin \omega t$ — (1)

If at any instant the current is I.



Then Potential difference across resistance

$V_R = IR$

and potential difference across capacitor

$V_C = IX_C$

∴ Net potential

$$V = \sqrt{(V_R)^2 + (V_C)^2}$$

$$V = \sqrt{I^2R^2 + I^2X_C^2}$$

(27)

(3) [( )] + [ ] = [ ]

प्रश्न क्र.

$$V = I\sqrt{R^2 + X_c^2}$$

$$\frac{V}{I} = \sqrt{R^2 + X_c^2}$$

Here $\frac{V}{I} = Z_{CR}$ called impedence of circuit.

$$\therefore Z_{CR} = \sqrt{R^2 + X_c^2}$$

or $$\boxed{Z_{CR} = \sqrt{R^2 + \left(\frac{1}{\omega C}\right)^2}}$$

Phase difference between resultant voltage and current.

If phase difference is ϕ.

then $$\tan\phi = \frac{V_C}{V_R}$$

$$\tan\phi = \frac{I X_c}{I R}$$

$$\tan\phi = \frac{X_c}{R}$$

$\because \boxed{X_c = \frac{1}{\omega C}}$

$$\tan\phi = \frac{1}{\omega C R}$$

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

Ans ⇒ 20.

Gauss theorem :- According to this theorem, the net electric flux passing passing through a closed surface is equal to $1/\varepsilon_0$ times of the total charge present inside the body.

If q is total charge inside the body then electric flux denoted by Φ_E is equal to $\Phi_E = \frac{q}{\varepsilon_0}$

where ε_0 is the absolute permitivity of the free space.

To prove Gauss theorem,

Consider an unsymmetrical body. Let a charge q is present at point O. P is a point on the surface of the body. Electric flux is coming out of the body.

परीक्षार्थी द्वारा भरा जावे ↓

परीक्षा का विषय	विषय कोड	परीक्षा का माध्यम	परीक्षा का दिनांक
Physics	210	English	11 03 2017

[redacted]

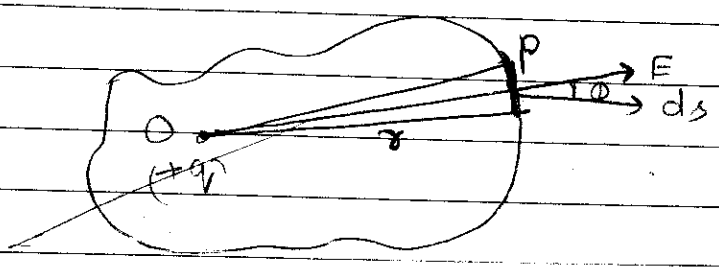
परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा
सेकेण्डरी सर्वी. परीक्षा
केन्द्र क्रमांक-212027

परीक्षक का नाम एवं हस्ताक्षर

अध्यक्ष / सहायक केन्द्राध्यक्ष के हस्ताक्षर

मुख्य उत्तर पुस्तिका के अंतिम पृष्ठ क्रमांक.....तक कुल प्राप्तांक ☐ + ☐ = ☐

29



Electric field at point P due to +q charge at point O.

$$E = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2}$$

Now net electric flux coming out from a small surface at point P

$$d\phi_E = E \cdot ds \cos\theta$$

$$d\phi_E = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2} ds \cos\theta$$

$$d\phi_E = \left(\frac{q}{4\pi\varepsilon_0}\right)\left(\frac{ds \cos\theta}{r^2}\right)$$

$$\therefore \quad \phi_E = \int \frac{q}{4\pi\varepsilon_0} \frac{ds\cos\theta}{r^2}$$

$$\phi_E = \frac{q}{4\pi\varepsilon_0} \int \frac{ds\cos\theta}{r^2}$$

But $\int \frac{ds\cos\theta}{r^2} = \int d\omega = 4\pi$ (solid angle)

$$\phi_E = \frac{q}{4\pi\varepsilon_0}(4\pi)$$

$$\boxed{\phi_E = \frac{q}{\varepsilon_0}}$$

Hence proved.