D.G.E -HR.SEC. EXAMINATION MARCH - 2015

REGISTER NUMBER **839166**

CANDIDATE NAME : **ROSHANKUMAR K**

SUBJECT : **005 PHYSICS (ENG)**

(C)

APPLIED FOR : SCAN

(B)

D.G.E -HR.SEC. EXAMINATION MARCH - 2015

(GHAFEDDFHDB)

SUB CODE : 005

(GHAFEDDFHDB)

SUBJECT : **005 PHYSICS (ENG)**

Marks already Awarded	Marks after Retotalling / Revaluation	+/-	Marks in Difference

Designation	Signature
Examiner 1	
Examiner 2	
Examiner 3	

J.D (Ret . / Rev)

J.D (H.S)

Director

Bundle No: 1 7 3

15/4/15 FN
AE 633

மதிப்பெண்கள் பக்கம் / Marking Page

Total Marks: 1 3 2

அரசுத் தேர்வுகள் துறை
DEPARTMENT OF GOVERNMENT EXAMINATIONS

Packet No. 0 4

HSE

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விடைத்தாள் திருத்துவோர் நிறைவு செய்ய வேண்டியவை
FOR THE USE OF EXAMINERS ONLY

வினாவாரியாக மொத்தம் Questionwise Total										பக்கவாரியாக மொத்தம் Pagewise Total			
வினா எண் Q.No	மதிப்பெண்கள் Marks	வினா எண் Q.No	மதிப்பெண்கள் Marks	வினா எண் Q.No	மதிப்பெண்கள் Marks	வினா எண் Q.No	மதிப்பெண்கள் Marks	வினா எண் Q.No	மதிப்பெண்கள் Marks	பக்க எண் Page No	மதிப்பெண்கள் Marks	பக்க எண் Page No	மதிப்பெண்கள் Marks
1	0	21	1	41	3	61		81		1	13	21	4
2	1	22	1	42	1+1	62		82		2	8	22	3
3	0	23	1	43	3	63	10	83		3	4	23	3
4	1	24	0	44	1+2	64	7	84		4	1	24	2
5	1	25	0	45		65	10	85		5	4	25	5
6	1	26	0	46	3	66		86		6	4	26	4 1/2
7	1	27	1	47	3	67		87		7	4 1/2	27	4 1/2
8	1	28	1	48	3	68	9	88		8	2 1/2	28	6
9	1	29	1	49		69		89		9	2	29	5
10	1	30	0	50	0+1	70		90		10	3	30	4
11	1	31	3	51	5	71		91		11	2	31	3+1
12	1	32		52		72		92		12	2	32	4+2
13	0	33		53	5	73		93		13	3	33	6
14	0	34	3	54	4	74		94		14	2	34	0+1
15	1	35	3	55		75		95		15	2	35	
16	1	36	3	56		76		96		16	4	36	
17	1	37		57	5	77		97		17	3 1/2	37	
18	1	38	3	58	5	78		98		18	2 1/2	38	
19	1	39	2	59	5	79		99		19	3 1/2	39	
20	0	40	3	60	5	80		100		20	3 1/2	40	
மொத்தம் TOTAL	15	மொத்தம் TOTAL	26	மொத்தம் TOTAL	51+4	மொத்தம் TOTAL	36	மொத்தம் TOTAL		மொத்தம் TOTAL	74	மொத்தம் TOTAL	54+4

வினாவாரியாக ஒட்டு மொத்தம்
Question-wise Grand Total: 128+4 132

பக்கவாரியாக ஒட்டு மொத்தம்
Page-wise Grand Total: 128 +04 132

633
AE: 15/4/15 FN

SO: 085

CE: 15/4/15
085

GCP-400-6--Gex-54--50,00,000--28-7-14 (HCL-6) —1

தேர்வு எழுதுபவர் செய்யக்கூடியவை மற்றும் செய்யக்கூடாதவை
Do's & Dont's for Candidates

1. முகப்புச்சீட்டில் உரிய இடத்தில் கையொப்பமிட வேண்டும்.
   Put your signature in the Top sheet in the appropriate place.
2. விடைத்தாளில் ஒரு பக்கத்திற்கு 20 முதல் 25 வரிகள் வரை எழுதவேண்டும்.
   Write 20 to 25 lines in a page.
3. விடைத்தாளின் இருபுறத்திலும் எழுத வேண்டும்.
   Write answers in both sides of paper.
4. செய்முறைகள் யாவும் விடைத்தாளின் பகுதியில் இடம் பெறவேண்டும்.
   All rough works must be done on the lower part of the page.
5. வினா எண் தவறாமல் எழுத வேண்டும்.
   Write the question numbers without fail.
6. இரு விடைகளுக்கிடையே இடைவெளி விட்டு எழுத வேண்டும்.
   Leave space between two answers.
7. வினாத்தாளின் வரிசை (A or B) மதிப்பெண்கள் பக்கத்தில் குறிக்கப்பட வேண்டும்
   The question paper booklet series. (A or B) should be marked in Marking Page.
8. விடைத்தாளில் நீலம்/கருப்புமை கொண்ட பேனாவால் விடைகளை தெளிவாக எழுத வேண்டும்.
   Anwers must be legibly written either in Blue or Black ink pen.
9. விடைத்தாளில் எழுதாத பக்கங்களில் குறுக்குக்கோடு இடவேண்டும்.
   Cross the unwritten pages.

1. வினாத்தாளில் எந்தவித குறியீடும் இட கூடாது.
   No marking in the question paper.
2. விடைத்தாளை சேதப்படுத்தக் கூடாது.
   Don't damage the answer paper.
3. விடைத்தாளில் எந்த ஒரு பக்கத்திலும் தேர்வு எண்/பெயர் எழுதக்கூடாது.
   Don't write name, Register Number in any page of the answer book.
4. வண்ணக்கலர் கொண்ட பேனா/ பென்சில் எதையும் பயன்படுத்தக் கூடாது.
   Don't write with sketch / colour pencils.
5. விடைத்தாள் கோட்டின் இடது மற்றும் வலது ஓரத்தில் எழுதக்கூடாது.
   Don't write on the margins.
6. விடைத்தாள் புத்தகத்தின் எந்த தாளையும் கிழிக்கவோ/நீக்கவோ கூடாது.
   Don't tare / remove any page from the answer book.

Physics

Part-I

1. (a) repulsive and attractive. X 0
2. (b) scanning 1
3. (d) voltage leads current by a phase angle ~~of~~ $\pi/2$. 0
4. (d) small couple per unit twist 1
5. (d) type of semiconductor material 1
6. (c) 1:4:9 1
7. (c) inside the sphere 1
8. (a) Increasing the filament current 1
9. (b) Intensity of incident radiation 1
10. (d) eletric potential 1
11. (b) capacitor 1
12. (a) electron 1
13. (b) only the frequency of carrier wave varies X 0
14. (c) $\pi/2$ X 0
15. (d) neutron number decreases by one 1
16. (c) 1 Wb 1
17. (d) EXOR 1

மதிப் பெண்கள் Marks

பக்க வாரியான மொத்தம் Pagewise Total Marks

13

வினா எண்.
Qn.No.

18. (d) Infinity 1

19. (a) contracts 1

20. (a) resistance 0

21. (a) zero 1

22. (a) $2 \to 1$ 1

23. (a) downwards 1

24. (d) $C^{-1} m^2 V$ 0

25. (a) 20 HM 0

26. (d) is zero 0

27. (a) transverse 1

28. (b) 200 MeV 1

29. (a) valence electrons 1

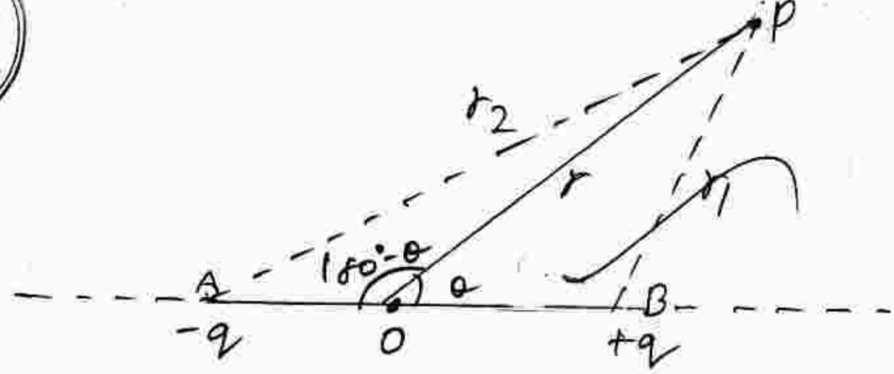
30. (a) 33°C. 0

Part-IV

10 63. Expression for electric potential at a point due to an electric dipole:

8

மதிப் பெண்கள் Marks



Electric potential at a point due to an electric dipole.

Let AB be the electric dipole. P is a point at a distance r from the centre O. A charge +q is placed at B and −q at B. Let the electric ~~dipole~~ moment be P.

1

1

The electric potential at point P due to charge +q is, $\frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{r_1}$ → (1)

1/2

The electric potential at point A due to charge −q is $\frac{1}{4\pi\varepsilon_0}\left(-\frac{q}{r_2}\right)$ → (2)

1/2

Total electric potential (V) = $\frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{r_1} - \frac{1}{4\pi\varepsilon_0}\cdot\frac{q}{r}$

$= \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r_1}-\frac{1}{r_2}\right)$ → (3)

பக்க வாரியான மொத்தம் Pagewise Total Marks

4

வினா எண். Qn.No.

Applying cosine's law,

$$r_1^2 = r^2 + d^2 - 2rd\cos\theta$$

$$= r^2\left(1 - \frac{2d\cos\theta}{r} + \frac{d^2}{r^2}\right)$$

Since $\frac{d^2}{r} << r$ it is neglected

$$\therefore r_1^2 = r^2\left(1 - \frac{2d\cos\theta}{r}\right)$$

$$r_1 = r\left(1 - \frac{2d\cos\theta}{r}\right)^{1/2}$$

(or) $$\frac{1}{r_1} = \frac{1}{r}\left(1 - \frac{2d\cos\theta}{r}\right)^{-1/2}$$

Using the binomial theorem and neglecting the powers, we have

$$\frac{1}{r_1} = \frac{1}{r}\left(1 + \frac{d\cos\theta}{r}\right) \rightarrow 4$$

Similarly, $r_2^2 = r^2 + d^2 - 2rd\cos(180° - \theta)$

$$= r^2 + d^2 + 2rd\cos\theta$$

$$r_2^2 = r^2\left(1 + \frac{2d\cos\theta}{r}\right)$$

$$r_2 = r\left(1 + \frac{2d\cos\theta}{r}\right)^{1/2}$$

(or) $$\frac{1}{r_2} = \frac{1}{r}\left(1 + \frac{2d\cos\theta}{r}\right)^{-1/2}$$

Using the binomial theorem and neglecting the powers,

மொத்த Pages Total Marks

400

மதிப் பெண்கள் Marks

$$\frac{1}{r_2} = \frac{1}{r}\left(1 - \frac{d\cos\theta}{r}\right) \rightarrow (5)$$

Substituting eqn (4) & (5) in eqn (3),

$$V = \frac{q}{4\pi\epsilon_0} \cdot \frac{1}{r}\left(\cancel{1} + \frac{d\cos\theta}{r} - \cancel{1} + \frac{d\cos\theta}{r}\right)$$

$$= \frac{q}{4\pi\epsilon_0} \cdot \frac{1}{r}\left(\frac{2d\cos\theta}{r}\right)$$

$$= \frac{1}{4\pi\epsilon_0} \cdot \frac{2qd\cos\theta}{r^2}$$

$$\boxed{V = \frac{1}{4\pi\epsilon_0} \cdot \frac{p\cos\theta}{r^2}} \quad (\because 2qd = p)$$

Special Cases:

1) If the point P lies on the axial line of charge +q, then $\theta = 0^\circ$, $\cos 0^\circ = 1$.

$$\therefore \boxed{V = \frac{p}{4\pi\epsilon_0 r^2}}$$

2) If the point P lies on the axial line of charge −q, then $\theta = 180^\circ$ $\cos 180^\circ = -1$

$$\therefore \boxed{V = \frac{-p}{4\pi\epsilon_0 r^2}}$$

பக்க வாரியான மொத்தம் Pagewise Total Marks

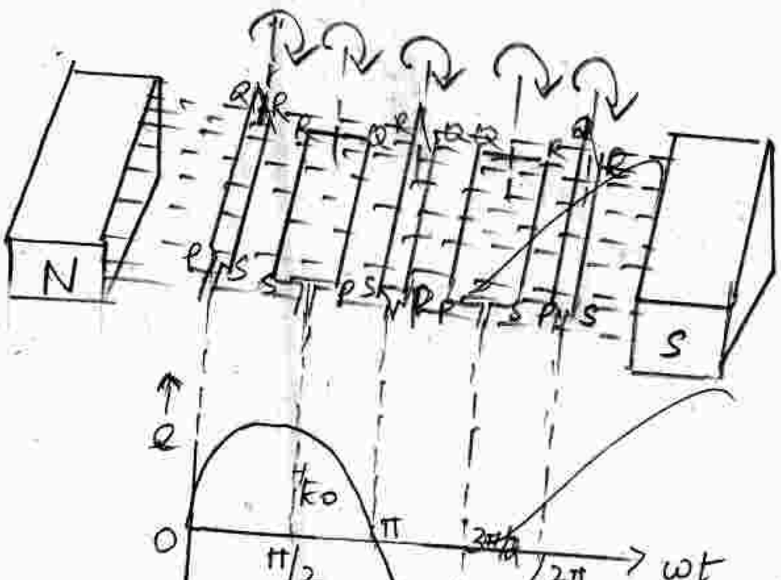
4

வினா எண். Qn.No.

3. If the point P lies on the equatorial line, the $\theta = 90^\circ$ $\cos 90^\circ = 0$

$\therefore \boxed{V=0}$

65. <u>Method of Inducing emf in coil by changing its orientation with respect to direction of magnetic field.</u>



PQRS is a conductor of rectangular coil of N turns having Area of cross section A. Let ω be the angular

வினா எண். Qn.No.

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velocity of the coil. Suppose the coil is in vertical position the distance ~~the~~ between the coil and magnetic field is zero. Let 't' be the time taken. The magnetic flux is given by,

$\phi = NBA\cos\theta$. → ①

The induced emf, $e = -\frac{d\phi}{dt}$

$$e = -\frac{d}{dt}(NBA\cos\omega t)$$

$$= -NBA\frac{d}{dt}(\cos\omega t)$$

$$= -NBA(-\sin\omega t \cdot \omega)$$

$$e = NBA\omega \cdot \sin\omega t \rightarrow ②$$

The maximum value of emf is given by, $\boxed{E_0 = NBA\omega}$ → ③ 1/2

$\therefore \boxed{e = E_0 \cdot \sin\omega t}$ → ④

The frequency of coil in frequency ν cycles per second is given by,

பக்க வாரியான மொத்தம் Pagewise Total Marks

4 1/2

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1. When $\omega t = 0$, the plane of the coil is perpendicular to the magnetic field and hence $\boxed{e = 0}$. 1/2

2. When $\omega t = \pi/2$, the plane of the coil is parallel to the magnetic field and hence $\boxed{e = E_0}$. 1/2

3. When $\omega t = \pi$, the plane of the coil is again at right angles to each other and hence $\boxed{e = 0}$. 1/2

4. When $\omega t = \frac{3\pi}{2}$, the plane of the coil is parallel to the magnetic field and hence $\boxed{e = -E_0}$. 1/2

5. When $\omega t = 2\pi$, the plane of the coil is again perpendicular to the magnetic field and hence $\boxed{e = 0.}$ 1/2

When the ends of the coil are connected to the Resistance R, the current is also sinusoidal in nature.

பக்க வாரியான மொத்தம் Pagewise Total Marks

2 1/2

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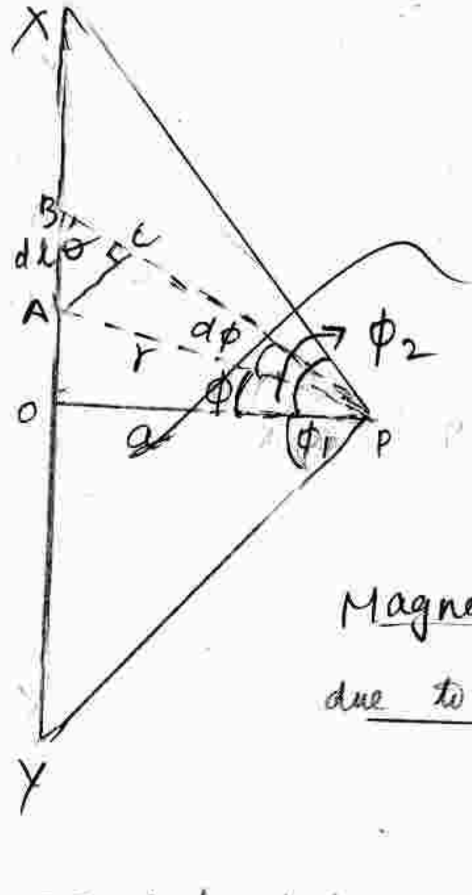
மதிப் பெண்கள் Marks

16) Expression for magnetic induction at a point due to an infinitely long straight conductor :



Magnetic induction at a point due to an infinitely long conductor

X Y is an infinitely long straight conductor placed in an uniform magnetic field B. Let P be a point at a distance r from the centre O. A B be the point and the distance between them is dl. The angle between A and B is θ. According to Biot - Savart law, the

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magnetic induction is given by,

$$dB = \frac{\mu_0}{4\pi} \cdot \frac{I dl \sin\theta}{r^2} \rightarrow (1)$$

Draw ~~BC~~ AC perpendicular to BP from A.

$\angle OPA = \phi$, $\angle APB = \theta$.

From ΔABC, $\sin\theta = \frac{AC}{AB} = \frac{AC}{dl}$

(or) $AC = dl \sin\theta \rightarrow (2)$

From ΔAPC,

~~$\sin\theta = r \cdot d\phi$~~ $AC = r\, d\phi \rightarrow (3)$

From eqns (2) & (3),

$$dl \sin\theta = r \cdot d\phi \rightarrow (4)$$

Substituting (4) in (1)

$$dB = \frac{\mu_0}{4\pi} \cdot \frac{I \cdot r\, d\phi}{r^2}$$

$$dB = \frac{\mu_0}{4\pi} \cdot \frac{I \cdot d\phi}{r} \rightarrow (5)$$

பக்க வாரியான மொத்தப் Pagewise Total Marks

3

மதிப் பெண்கள் Marks

In ΔOPA, $\cos\phi = \frac{a}{r}$

$$r = \frac{a}{\cos\phi} \rightarrow (6)$$

substituting (6) in (5), then

$$dB = \frac{\mu_0}{4\pi} \cdot \frac{I \cdot d\phi}{\frac{a}{\cos\phi}}$$

$$dB = \frac{\mu_0}{4\pi} \cdot \frac{1}{a}\, d\phi \cos\phi \rightarrow (7)$$

∴ The total magnetic flux is,

$$\int dB = \frac{\mu_0}{4\pi a} \int_{\phi_1}^{\phi_2} \cos\phi \cdot d\phi$$

$$B = \frac{\mu_0}{4\pi a}[\sin\phi_1 + \sin\phi_2]$$

For infinitely long conductor, $\phi_1 = \phi_2 = 90°$

$$\therefore B = \frac{\mu_0}{4\pi a} \cdot (1+1)$$

$$B = \frac{\mu_0}{2\pi a} \rightarrow (8)$$

பக்க வாரியான மொத்தம் Pagewise Total Marks

2

வினா எண்.
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If the permeability is filled with μ_i,

then, $\boxed{B = \frac{\mu I}{2\pi a}}$ → (9)

This was the expression for magnetic induction at a point due to an infinitely long conductor.

68. Cosmic Rays :

The ionising radiation which are many times stronger than γ rays, entering the Earth from all directions from cosmic or interstellular space is known as cosmic rays. They can be broadly classified into two types :-

i) Primary cosmic rays

ii) Secondary cosmic rays.

The primary cosmic rays are those coming ~~from~~ the upper layer of atmosphere. They are made up 90 % of proton,

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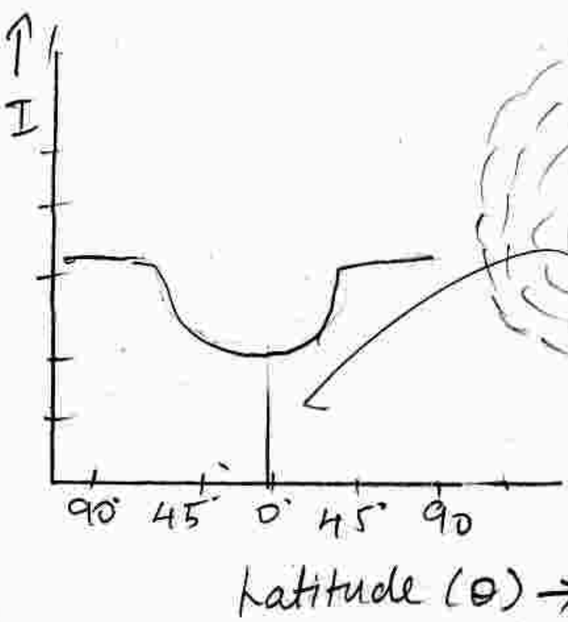
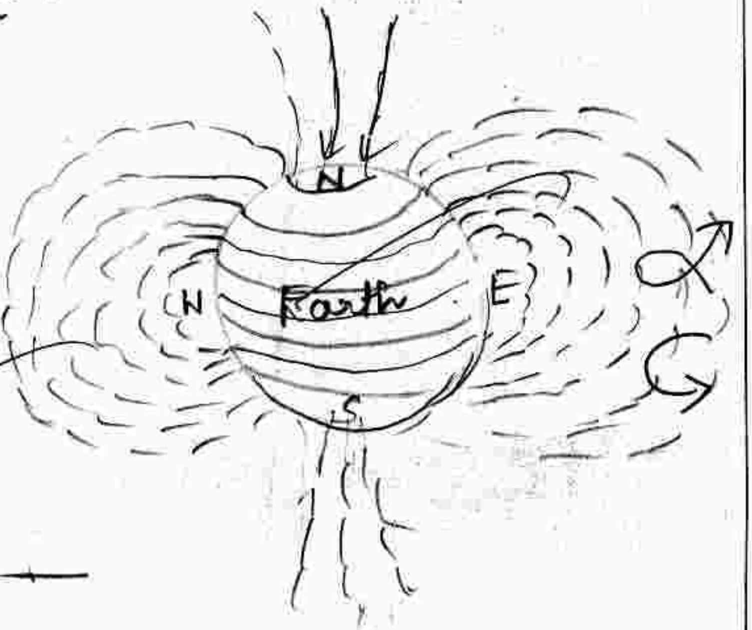
9 % of Helium and remaining heavy nuclei. The secondary cosmic rays are formed when the primary cosmic rays interacts with the gases in the upper atmosphere. They are made up of elements like proton, electrons, α particles, mesons, positrons, etc in different proportions.

(i) **Latitude effect:**





2

1

The study of variation of cosmic ray intensity with geomagnetic latitude

பக்க வாரியான மொத்தம் Pagewise Total Marks

3

வினா எண். Qn.No.

Shows that the intensity is maximum at poles. minimum at the equator and constant between the latitudes of 42° and 90°. The cosmic ray intensity with geomagnetic latitude is called latitude effect.

The decrease in the intensity of cosmic rays is due to the change in the Earth's magnetic flux. The charged particles the approaches the Earth near at poles have travel in the same direction of magnetic field. Hence, they experience no force and they easily reach the surface of Earth and hence Maximum intensity at the poles. The particles that approaching the equator have to travel in a direction perpendicular to the magnetic field. Only particles with sufficient energy can reach the Earth while the slower particles are

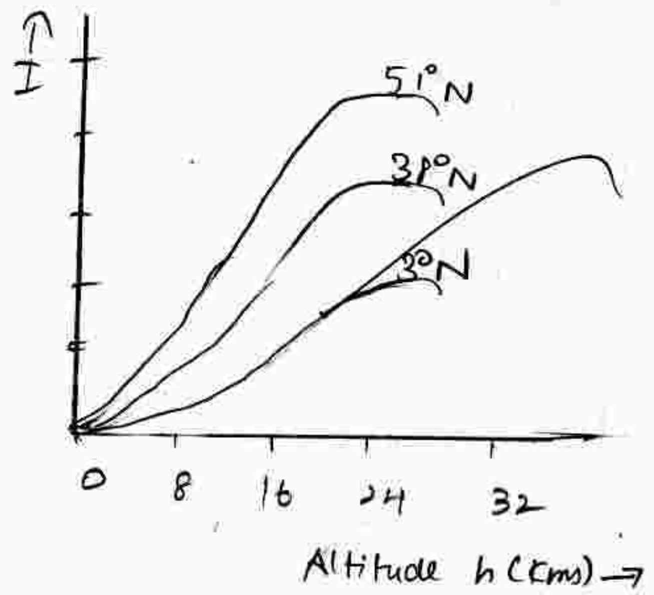
2

பக்க வாரியான மொத்த Pagewise Total Mark

மதிப்பெண்கள்
Marks

deflected back into the cosmos and hence, minimum intensity at the Equator.

(ii) Altitude effect :



The study of variations of cosmic rays with altitude is called Altitude effect. It may be seen that the altitude increases and reaches a maximum at a height of 20 kms. Above this height, there is a fall in intensity. The experiment results are similar at the different places of earth.

பக்க வாரியான மொத்தம்
Pagewise Total Marks

வினா எண். Qn.No.

மதிப்பெண் Mark

Part-III

51. **Properties of electric lines of force:**

- The lines of force starts from positive charges and terminate at the negative charges.

- Lines of force never intersect.

- The tangent to the lines of force at any point gives the direction of electric field at that point.

- The number of lines per unit area through a plane at right angles is directly proportional to the magnitude of E. This means that where the lines of forces are close together, E is large and where they are far apart, E is small.

5

4

பக்க வாரியாக மொத்த Pagewise Total Marks

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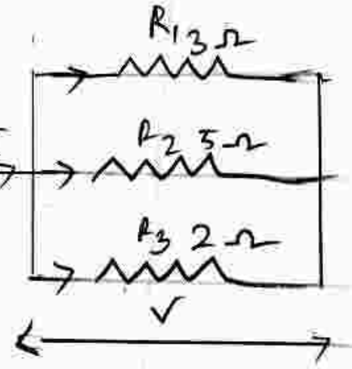
(4) Each unit positive charge gives rise to $\frac{1}{\varepsilon_0}$ lines of force in free space. Hence, number of lines ~~of forces~~ originating from a point charge q is given by $N = \frac{q}{\varepsilon_0}$ in free space.

53 Given: $R_1 = 3\,\Omega$

$R_2 = 5\,\Omega$

$R_3 = 2\,\Omega$

$V = 15\,V$



To find: $R_p = ?$

$I = ?$

The resistors are in parallel connection

$$\therefore \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$= \frac{1}{3} + \frac{1}{5} + \frac{1}{2}$$

$$= \frac{10 + 6 + 15}{30}$$

$$\frac{1}{R_p} = \frac{31}{30} \Rightarrow \boxed{R_p = \frac{30}{31}\,\Omega \text{ (or) } 0.9677\,\Omega}$$

1

$$31 \overline{)30} \quad 0.9677$$

0

300

279

210

1

பக்க வாரியான மொத்தம் Pagewise Total Marks

3 1/2

வினா எண். Qn.No.

மதிப் பெண்க Marks

$\therefore$ The effective resistance connected in parallel is $\frac{30}{31}\,\Omega$ (or) $0.9677\,\Omega$.

Current (I_1) flowing through $R_1 = \frac{V}{R_1} = \frac{15}{3}$

$I_1 = 5A$ 1M

Current $I_2 = \frac{V}{R_2} = \frac{15}{5}$, current $I_3 = \frac{V}{R_3} = \frac{15}{2}$

$I_2 = 3A$ 1M

$I_3 = 7.5A$ 1M

$\therefore$ Total current $(I) = I_1 + I_2 + I_3$

$= 5A + 3A + 7.5A$

$\boxed{I = 15.5A}$ 1

$\therefore$ The total current drawn on the supply is 15.5A.

54. Given: $G = 20\,\Omega$

$I_g = 50mA = 50\times10^{-3}A$.

$A = 20A$

$V = 120V$

$S = ?$

$R = ?$

2M

பக்க வாரியான மொத்தம் Pagewise Total Marks

மதிப் பெண்கள் Marks

i) An ammeter range of 20A :

$$S = G \cdot \frac{I_g}{I - I_g}$$

$$= 20 \cdot \frac{50 \times 10^{-3}}{20 - 50 \times 10^{-3}}$$ 1/2

$$\begin{array}{r} 20.00 \\ -\ 0.05 \\ \hline 19.95 \end{array}$$

$$= \frac{20 \times 50 \times 10^{-3}}{20 - 0.05}$$

$$= \frac{20 \times 0.05}{19.95}$$ 1/2

$$\boxed{S = 0.05\ \Omega}$$

∴ The Galvanometer should be connected to an ammeter rage of 0.05 Ω.

ii) Voltmeter range of 120V :

$$R = \frac{V}{I_g} - G$$

$$= \frac{120}{50 \times 10^{-3}} - 20$$ 1/2

பக்க வாரியான மொத்தம் Pagewise Total Marks

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$$= \frac{120}{5\times10^{-2}} - 20$$

$$= \frac{12000}{5} - 20$$

$$= 2400 - 20$$

$$\boxed{R = 2380\ \Omega}$$

∴ The galvanometer should be connected to a voltmeter range of 2380 Ω.

57. Five properties of X-Rays :

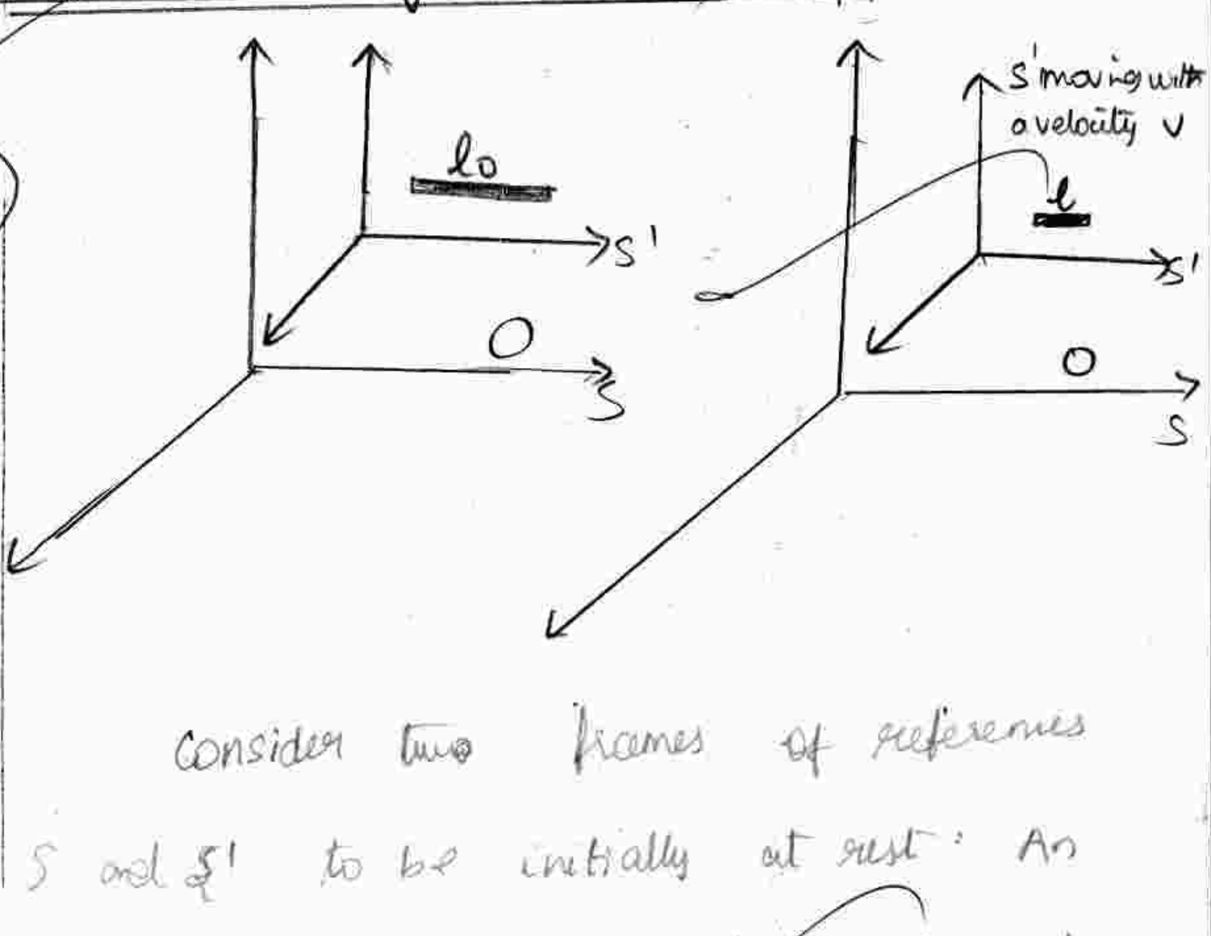
- X-Rays are electromagnetic waves of short wavelength. They are invisible to eyes.
- They ionize the gas through which they pass.
- They affect the photographic plates.

3½

• They undergoes reflection, refraction, diffraction, interference and polarisation.

• When X-Rays falls on a suitable metals, they produce photoelectrons. This is called photoelectric effect.

58. Lorentz Fitzgerald Contraction:



Consider two frames of references S and S' to be initially at rest. An Observer is place in the frame S and a rod in the frame S'. The length of the rod measured by oberser in O is l_0.

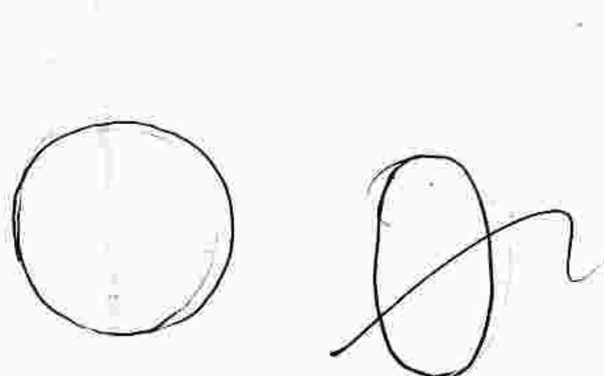
Now S' is moving with a velocity v. Now the length of the rod is measured by the observer as l.

$$l = l_0 \sqrt{1-\frac{v^2}{c^2}}$$

i.e., $l < l_0$.

Thus, the length of the rod moving with a velocity v relative to the observer in rest is contracted by a factor $\sqrt{1-v^2/c^2}$. This is called length contraction or Lorentz Fitzgerald contraction.

Example :-



Object seen at rest

Object seen in moving

3

A circular object will appear as an ellipse for a fast moving observer.

59 Expression for de-Broglie wavelength of matter waves:

Consider a photon. If it is assumed to have wave character, then its energy is given by, $E = h\nu$ → ① (by Planck's quantum theory).

where h is the Planck's constant

ν is the frequency.

If the photon has particle character, then its energy is given by, $E = mc^2$ → ② (by Einstein's equation)

where m is the mass

c is the velocity of light.

From equations ① & ②,

$h\nu = mc^2$

$\frac{h \cdot c}{\lambda} = mc^2 \quad (\because \nu = \frac{c}{\lambda})$

3

வினா எண். Qn.No.

$\lambda = \frac{h \cdot c}{mc^2}$

$\boxed{\lambda = \frac{h}{mc}}$

De broglie assumed the wavelength is applicable to any material particle. Therefore, mass of wave is replaced by mass of the ~~parti~~ material and velocity 'c' is replaced by velocity 'v' of material.

$\therefore \boxed{\lambda = \frac{h}{mv}}$ or $\boxed{\lambda = \frac{h}{p}}$

where $mv = p$ is the momentum of the particle.

---

60. **Given**: Bindi energy per nucleon for $_6C^{12} = 7.68$ Mev

Binding energy per nucleon for $_6C^{13} = 7.47$ Mev

To find:-

Energy required to remove a neutron ($_0n^1$ = ?)

2

மதிப் பெண்கள் Marks

The reaction may be written as

$_6C^{13} \longrightarrow {}_6C^{12} + {}_0n^1$

$$7.68 \times 12$$
$$1536$$
$$768$$
$$92.16$$

$$7.47 \times 13$$
$$2241$$
$$747$$
$$97.11$$

Binding energy for 12 nucleons in $_6C^{12}$ $= 12 \times 7.68$

$= 92.16$ Mev

Binding energy for nucleon in $_6C^{13}$ $= 13 \times 7.47$

$= 97.11$ Mev

Total Binding energy of reactants = Total Binding energy of products

$97.11 = 92.16 + {}_0n^1$

${}_0n^1 = 97.11 - 92.16$

$$97.11$$
$$-92.16$$
$$4.95$$

$\boxed{{}_0n^1 = 4.95 \text{ Mev}}$

∴ The energy required to remove a neutron from $_6C^{13}$ nucleus is 4.95 Mev.

பக்க வாரியான மொத்தம் Pagewise Total Marks

5

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மதிப் பெண்கள் Marks

Part-II

31. Coulomb's law in electrostatics :

Coulomb's law states that, "the force of attraction or repulsion between any two objects is directly proportional to the product of masses and inversely proportional to the square of the distance between them".

$F \propto \frac{q_1 q_2}{r^2}$ (or) $F = K \cdot \frac{q_1 q_2}{r^2}$

where F is the force,
K is the constant of proportionality
$q_1 q_2$ are the masses
r is the radius

3

34. Comparison of emf and potential difference:

Sl.No	Emf	Potential difference
1.	The difference in potential between two points in an open circuit.	The difference of potentials between any two points in a closed circuit.

1/2

பக்க வாரியான மொத்த Pagewise Total Marks

$3\frac{1}{2}$

மதிப் பெண்கள் Marks

Sl.No	Emf	Potential difference
2.	The Emf is independent external resistance of the circuit.	It is proportional to the resistance between any two points in a circuit.
3.	It is a cause	It is an effect.

1½

Three applications of superconductors.

Superconductors forms the basis of energy saving power systems namely superconducting generators which are smaller in size and weight in comparison with the conventional generators. 1

Superconducting magnetic propulsion system can be used to launch satellites directly into orbits without the use of rockets. 1

Superconductors are also used as storage or memory elements in computer 1

பக்க வாரியான மொத்தம் Pagewise Total Marks

4½

வினா எண். Qn.No.

36. Fleming's left Hand rule :

The forefinger, middle finger and the thumb of a left hand are held in mutually perpendicular directions. If the forefinger points in the direction of magnetic field, the middle finger points in the direction of current, then the thumb will point in the direction of force on a conductor.

38. Quality factor :

Quality factor or Q factor of a series resonance circuit is defined as the ratio of voltage developed across the coil or capacitor to the applied voltage.

$$Q \text{ factor} = \frac{\text{Voltage across L or C}}{\text{Applied voltage}}$$

$$Q = \frac{1}{R}\sqrt{\frac{L}{C}}$$

3

3

3

3

6

மதிப்

Factors on which the amount of optical rotation depends on :

- the temperature of the light
- decrease in the intensity
- concentration in terms of solution and
- wavelength of the light used.

Given : $R = 3m$

$n = 8$, $r_8 = 3.6\ mm = 3.6 \times 10^{-3}\ m$.

$\lambda = ?$

We know that $r_n = \sqrt{nR\lambda}$

Squaring on both sides,

$r_n^2 = nR\lambda \Rightarrow \lambda = \frac{r_n^2}{nR}$

$= \frac{3.6 \times 3.6 \times 10^{-6}}{8 \times 3} = 54 \times 10^{-8}\ m.$

$\boxed{\lambda = 5400\ \mathring{A}}$

$\therefore$ The wavelength of light used is $5400\ \mathring{A}$.

பக்க வாரியான மொத்தம்
Pagewise Total Marks

5

வினா எண். Qn.No.

41. Ionization potential of an atom :

Ionization potential of an atom is defined as the accelerating potential which makes the impigning electron to acquire a sufficient energy to knock down down an electron and thereby ionizing the atom.

Example : Ionization potential of hydrogen atom is 13.6 ev.

42. Given : $R = 1.097 \times 10^7 m^{-1}$.

Long wavelength of Lyman series $(\lambda) = ?$

For long long wavelength of Lyman series, $n_1 = 1$, $n_2 = 2$.

$$\bar{V} = \frac{1}{\lambda} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

3

4

மதிப் பெண்கள் Marks

$= 1.097 \times 10^7 \left(1 - \frac{1}{4}\right)$

$= 1.097 \times 10^7 \times \frac{3}{4}$

$= 1.097 \times 0.75 \times 10^7$

$\lambda = 0.82275 \times 10^7$

$\lambda = 82275 \times 10^2$ m

$4\overline{)3}$ = 0.75

30
28
20
20
0

1.097 × 0.75
5485
7679
0000
0.82275

∴ The long wavelength of Lyman series is $82275 \times 10^2 m$.

43 <u>Threshold frequency</u>:

Threshhold frequency is defined as the minimum frequency below which the wavelength of electrons stops completely, however larger and greater the intensity may be.

3

பக்க வாரியான மொத்தம் Pagewise Total Marks

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44 Curie.

The Curie is defined as the quantity of radioactive substance which gives 3.7×10^{10} Becquerels. This is equal to the activity of one gram of radium.

1

46. Different methods of doping a semiconductor:

The impurity atoms are added to the pure semiconductor in its molten state

The pure semiconductor is bombarded by the ions of impurity atoms.

When the semiconductor crystal, containing the impurity atoms gets heated, the impurity atoms diffuse into the hot crystal.

3

2

4 + 2

வினா எண். Qn.No. | மதிப்பெண்கள் Marks

47. De - Morgan's theorems :

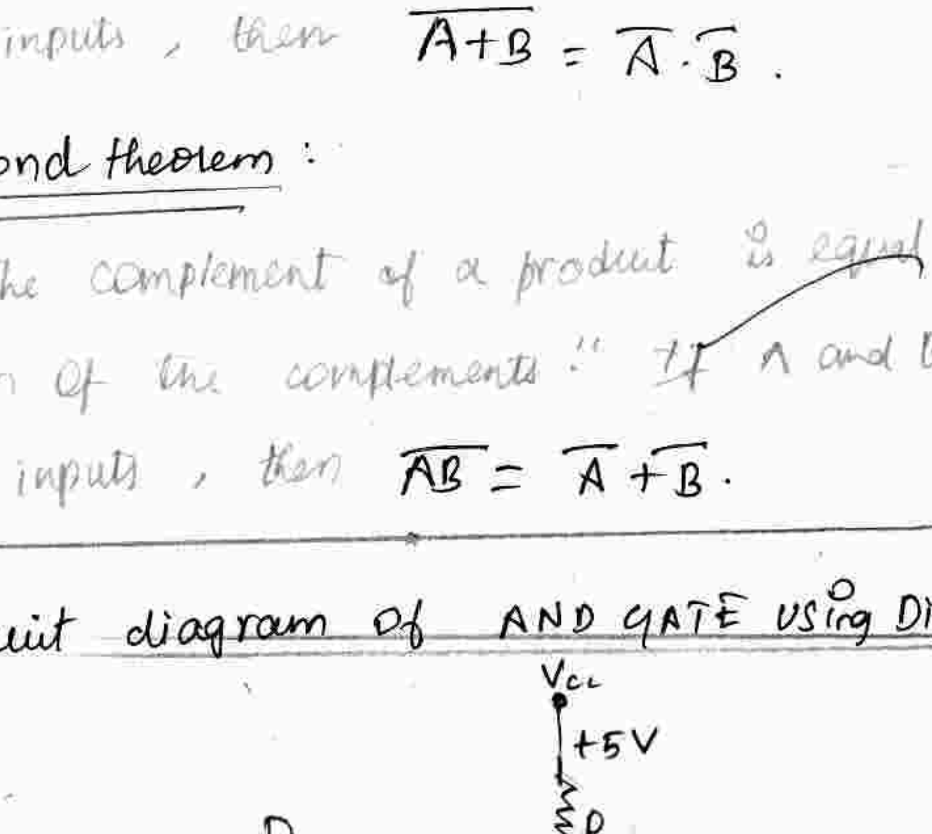
First theorem :

"The complement of a sum is equal to the product of the complements". If A and B are the inputs, then $\overline{A+B} = \overline{A} \cdot \overline{B}$. 1½

Second theorem :

"The complement of a product is equal to the sum of the complements". If A and B are the inputs, then $\overline{AB} = \overline{A} + \overline{B}$. 1½

48 Circuit diagram of AND GATE using Diodes :



AND GATE USING DIODES. 3

பக்க வாரியான மொத்தம் Pagewise Total Marks

6

வினா எண். Qn.No.

50. Modulation Factor in Amplitude modulation:

Modulation Factor is defined as the "ratio of change of amplitude of frequency in carrier wave to the frequency of unmodulated carrier wave".

Modulation factor = $\dfrac{\text{change amplitude of frequency in carrier wave before interchanging}}{\text{Amplitude of frequency in carrier wave after interchanging}}$

$= \dfrac{\text{Signal amplitude}}{\text{Carrier amplitude}}$

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Marks

பக்க வாரியான மொத்தம்
Pagewise Total Marks

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