PUX-32J

GOVERNMENT OF KARNATAKA

KARNATAKA STATE PRE-UNIVERSITY EDUCATION EXAMINATION BOARD

II YEAR P.U.C. EXAMINATION OF MARCH-2019

MAIN ANSWER BOOK

Please read the instructions overleaf before filling in

Answer Book Sl. No.	Register No. of the Candidate
2068048	7 7 7 9 3 7

Subject Code: 33 Subject: PHYSICS

Sl. No. of Additional answer sheets used	No. of pages used in Main Answer book	No. of pages used in Addnl. answer book/s	Total No. of Pages used
1. 2518038.	22	14	236.
2.			
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Certified that the entries made above by the Candidate are found to be correct

01.03

Signature of the Invigilator with date

FOR THE USE OF EXAMINERS ONLY

Marks awarded

Part	1	2	3	4	5	6	7	8	9	10	Total Marks
	1	1	1	1	0	0	1	1	1	1	08
	11	12	13	14	15	16	17	18	19	20	
	2	2	1	2	—	0	—	2	—	—	09
	21	22	23	24	25	26	27	28	29	30	
	3	3	2	3	2	DE 5	3	—	5		26
	31	32	33	34	35	36	37	38	39	40	
	4	—	5	5	0	(2) 3	—	—	—	—	17
	41	42	43	44	45	46	47	48	49	50	
	51	52	53	54	55	56	57	58	59	60	
	61	62	63	64	65	66	67	68	69	70	
	71	72	73	74	75	76	77	78	79	80	

Grand Total in Words	Sixty Only	Grand Total in Figures	60

INSTRUCTIONS TO CANDIDATES

1. Write your register number Correctly on the space provided on the Facing Sheet of the Answer book and the top left side of Additional answer sheets. Over writing should be attested by the Room Invigilator.
2. Write answers in both sides of the sheet using BLUE/BLACK ink or ball point pen.
3. Obtain Additional Sheets, Graph Sheets, Mathematical table from the Invigilator if required. Enter the serial numbers of all the Additional sheets used.
4. Intimate disorders if any, in the Main Answer book/ Additional sheets to the invigilator.
5. Indicate the Correct question number in the margin.
6. Obtain the permission of the Invigilator for change of PEN / INK.
7. All rough work should be made on a particular page with the heading ROUGH WORK and cross it.
8. Do not write in the margin and leave any page UNUSED except at the end of answers.
9. No Candidate is permitted to leave the examination hall within 30 minutes from the commencement of the examination. Any candidate who leaves after 30 minutes will not be allowed again to the examination hall.
10. If you want to make any request to the Room Invigilator, just stand up to attract his / her attention. Do not shout or leave your place. The Invigilator will come to you.
11. During the examination if the candidate wants to go out, for urination etc., same may be informed to the invigilator. While going out, the Answer paper, Question paper etc., should be handed over to the Room Invigilator for safe custody.
12. After completion, just stand up & inform the same to the Room Invigilator who in turn will collect the papers and gets your signature on the diary maintained by the Invigilator.
13. The following misdeeds will attract disciplinary actions and criminal prosecution.
    a) Breach of silence.
    b) Use of books, notes, manuscripts, etc., pertaining to the subject in the examination hall.
    c) Talking or signalling to other Candidates.
    d) Candidates copying from the answer books of the other candidates or from other source.
    e) Sending of answer books or additional sheets or question paper out of the examination hall.
    f) Impersonation.
    g) Taking the answer books or additional sheets received for writing the answers out of the examination hall during or after the examination.
    h) Tearing or insertion to the answer books and the additional sheets.
    i) Writing an appeal or request to the valuator in the answer book.
    j) Mobile Phones, Pagers are strictly prohibited in the Examination Hall.
    k) Simple calculators can be used. Scientific calculators allowed only for Statistics paper.
14. After completion of writing, Count the No. of pages used and fill the columns provided on the facing sheet of the main answer book.
15. Candidates suffering from infectious diseases are not allowed to sit in the examination hall.
16. Candidates should strike off the subject which is not applicable.

Register No. of the Candidate					
7	7	7	9	3	7

PART - A

I).

1). **Coulomb's law** :- It states that, "The electrostatic force of attraction or repulsion between two point charges is directly proportional to the product of magnitude of charges and inversely proportional to the square of the distance between them, acting along the line joining the two charges.

i.e. $F \propto \frac{q_1 q_2}{r^2} \Rightarrow F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$

2). **Electrical resistivity** of material of a conductor is defined as the opposition offered by the body (or numerically equal to resistance) of unit length per unit area.

i.e. We have, $R = \rho\left(\frac{l}{A}\right)$ if $l = 1\,m$ & $A = 1\,m^2$

then $R = \rho$.

3). **Expression for force acting on moving charge in a magnetic field**, $F = Bqv\sin\theta$.

4). Magnetic susceptibility is defined as the ratio of magnetisation of a material to the magnetic intensity. 1

5). We have, $L \propto n$ 1

ie Self inductance of a coil is directly proportional to the no. of turns in the coil.

Hence, more the no. of turns, greater will be the value of self inductance and vice versa. 1

6). Posn of the object, at ∞ 1

At ∞.

7). For Brewster's angle (i.e. $n = \tan i_B$), the angle of incidence (polarising angle) of 45°. 1

$i_B = 45^\circ$

$\therefore n = 1$

8). i). Thermionic emission. 1

ii). Photoelectric emission, etc.. 1

9). $E_n = \frac{-13.6}{n^2}$ 1

10). Relation b/w Half life and Mean life is - 1

$$\text{Half life} = \frac{1}{\text{Mean life}(\tau)}$$

i.e. $\frac{0.693}{\lambda} = \frac{1}{\text{Mean life}(\tau)}$ 1

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PART-B.

II).

11). **Basic properties of charge:**

i). Like charges repel each other and unlike charges attract each other.

ii). Charge is additive in nature.

iii). Charge is conserved.

iv). Charge is quantized.

v). Charge is a scalar quantity.

2

12). We have,

$$I = neAV_d$$

Expression for drift velocity (V_d) in terms of current is given by

$$V_d = \frac{I}{neA}$$

$V_d \rightarrow$ drift velocity

$I \rightarrow$ current

$n \rightarrow$ number of electrons

$e \rightarrow$ charge on electron i.e, $1.6 \times 10^{-19} C$

$A \rightarrow$ Area of the conductor.

2

4

13) Magnetic dip or Inclination:

Dip at a place is defined as the angle made by the Earth's total magnetic field to the horizontal component of the Earth's magnetic meredian.

Declination: It is defined as the angle made between the magnetic meredian and geographic meredian.

18).

n-type semiconductor.	p-type semiconductor.
* n-type semiconductor is obtained by doping an intrinsic semiconductor like pure Si/Ge with pentavalent impurities like Arsenic, Bismuth, antimony etc.	p-type semiconductor is obtained by doping an intrinsic semiconductor like pure Si/Ge with trivalent impurities like Aluminium, Galium, Indium etc.
* Majority charge carriers are electrons and minority charge carriers are holes.	Majority charge carriers are holes and minority charge carriers are electrons.
* No. of electrons are greater than holes ie. $n_e >> n_h$	No. of holes are greater than no. of electrons i.e. $n_h >> n_e$

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16). Diffraction : The phenomenon of splitting up of composite light into its constituent colours, is called diffraction of light.

0

14). Expression for speed of light in terms of 'μ_0' and 'ε_0' is,

$$C = \frac{1}{\sqrt{\mu_0 \varepsilon_0}} = 3 \times 10^8 \text{ ms}^{-1}$$

2 ε_0 - permittivity of free space.

μ_0 → permeability of free space.

PART - C.

III).

22). Three types of Energy loss in a transformer are :

i). Eddy currents.

ii) Hysteresis

iii). Resistance of the windings.

iv). Flux leakage

3

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29) Postulates of Bohr's atomic model:

I Postulate: An electron in an atom revolve round the nucleus in certain stable orbits called stationary orbits. An electron in an atom does not radiate energy in free states.

II Postulate: An electron in an atom revolve around the nucleus have angular momentum (h) which is equal to integral multiple of $\frac{h}{2\pi}$

i.e. $L = mvr = \frac{nh}{2\pi}$ where, $n = 1, 2, 3, \ldots$

3

III Postulate: An electron in an orbit can make a transition from stationary orbit of higher energy level (E_2) to the stationary orbit of lower energy (E_1), whose difference is equal to the energy of the photon ($h\nu$).

i.e. $E_2 - E_1 = h\nu$

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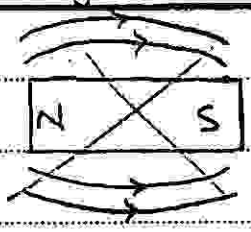
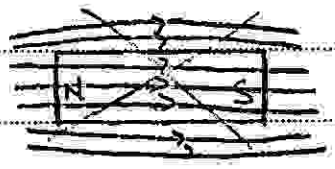
21). Differences between 'dia' and 'Ferro' magnetic materials:

Diamagnetic materials.	Ferromagnetic materials.
	
* Diamagnetic materials are the materials which move from strong magnetic field to weak magnetic field.	Ferromagnetic materials are the materials which move from weak magnetic field to strong magnetic field.
* The magnetic susceptibility of diamagnetic materials is small and negative.	The magnetic susceptibility of ferromagnetic materials is large & positive.
* The magnetic permeability of the materials is less than one.	The magnetic permeability of materials is much greater than one.
* The diamagnetic materials are independent of temperature.	The ferromagnetic matrials varies inversely to temperature.
* The materials are weakly attracted/repel each other.	The materials are strongly attracted by magnetic field
* Ex: Gold, Silver etc..	Ex: Iron,

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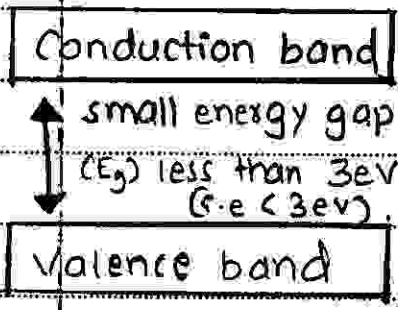
25). Band theory with respect to semiconductors.

In Semiconductors,



* In semiconductors, there is a small energy gap (E_g) of less than 3eV i.e (3eV) in between conduction band and valence band.

~~* The electrons are partially filled~~

* Conduction band is partially filled with electrons.

* Their electrical properties lies in between metals and semi-conductors.

* Valence band contains valence electrons. For Ex, For pure Si & Ge valence electrons are 4.

2

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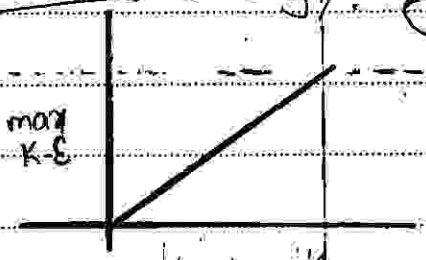
23). **Experimental Observations of Photoelectric effect:**

*. Photoelectric effect is an ~~instantaneous~~ process.

*. For the photosensitive material, there exists a minimum frequency below which no photo electric emission occurs or stopping potential is zero, is called threshold frequency (ν_0)

*. For a frequency above threshold frequency, Intensity of ~~m~~ is directly proportional to max. Kinetic energy.



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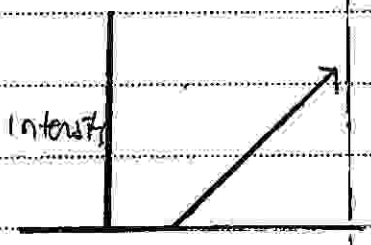
*. For a frequency above threshold frequency, there is an increase in kinetic energy.



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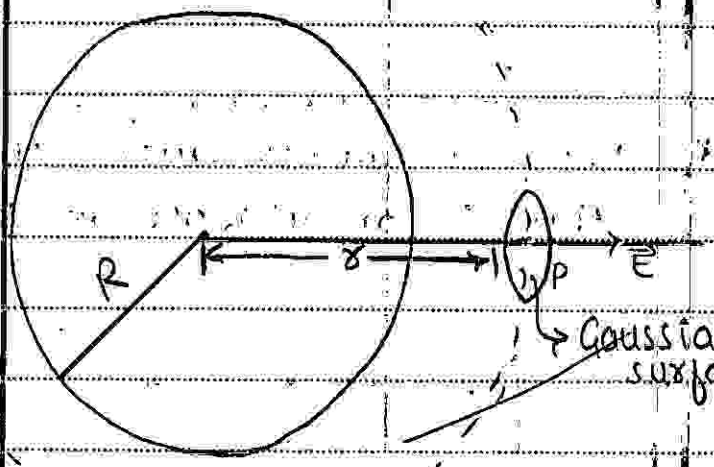
PART-D

IV).

27). **Gauss's law:** It states that, "the net/total electric flux through any closed surface is equal to $\left(\frac{1}{\varepsilon_0}\right)$ times the charge enclosed by the conductor.

i.e. $\boxed{\phi_{total} = \left(\frac{1}{\varepsilon_0}\right) q}$

Expression for Electric Intensity at a point outside the uniformly charged shell:



Consider a uniformly charged spherical shell of radius 'R'. Let P be a point at a distance 'r' from the centre of spherical shell, where electric field / intensity is calculated.

Electric flux, $d\phi = E\,ds\cos\theta$.

$d\theta = 0$, $\cos\theta = 1$.

$\therefore d\phi = E\,ds$ ... (1).

Flux through Gaussian surface

$\int d\phi = E \int ds$.

$\therefore \phi = ES$

where, $S = 4\pi r^2$ (surface area of sphere)

$\therefore \phi = E \cdot 4\pi r^2$ ... (2).

From Gauss's law, we have,

$\phi = \left(\frac{1}{\varepsilon_0}\right) q$ ... (3).

From (2) & (3),

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

P.T.O...

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

If the point P is on the surface of shell, then $r = R$

∴ [Eqn (4)] becomes,

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

Since, $q = \sigma \cdot dS$

$$q = \sigma \cdot 4\pi R^2$$

$$E = \frac{\sigma \cdot 4\pi R^2}{4\pi\varepsilon_0 \cdot R^2}$$

$$E = \frac{\sigma}{\varepsilon_0}$$

ii). Electric field inside the shell.

Since, the charge $q = 0$, inside the shell

∴ Electric intensity is zero inside the shell. $\{\because \phi = \frac{1}{\varepsilon_0}(0)\}$

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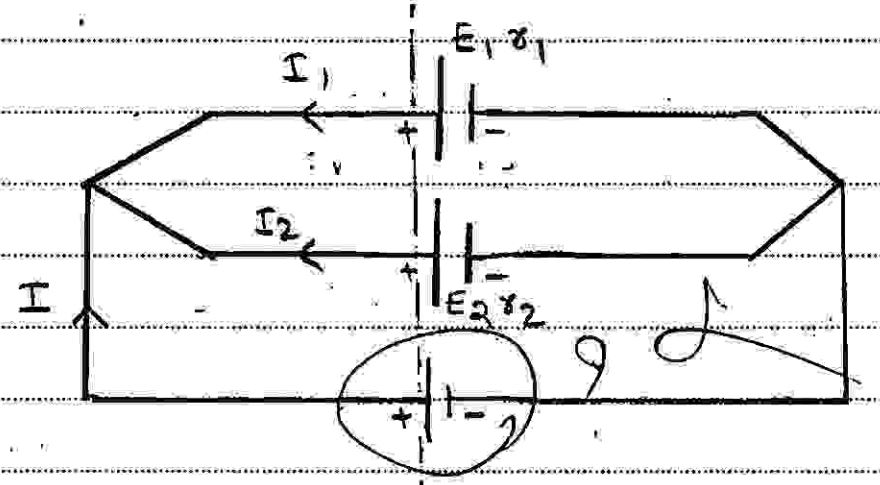
28). Expression for equivalent resistance and equivalent emf of the parallel combination.



Consider two cells of emfs E_1 & E_2 having internal resistances r_1 & r_2, connected in parallel.

In parallel combination, voltage remains same, current branches.

$\therefore \quad I = I_1 + I_2$

We have, $V = E - Ir$ ——— (1)

Current through first cell,

$$I_1 = \frac{E_1 - V}{r_1}$$

Current through second cell,

$$I_2 = \frac{E_2 - V}{r_2}$$

$$I = \frac{E_1 - V}{r_1} + \frac{E_2 - V}{r_2}$$

$$I = \frac{(E_1 - V)r_2 + (E_2 - V)r_1}{r_1 r_2}$$

$$I = \frac{E_1 r_2 - V r_2 + E_2 r_1 - V r_1}{r_1 r_2}$$

$$I = \frac{E_1 r_2 + E_2 r_1 - V(r_1 + r_2)}{r_1 r_2}$$

$$\therefore I(r_1 r_2) = E_1 r_2 + E_2 r_1 - V(r_1 + r_2)$$

$$\therefore V(r_1 + r_2) = E_1 r_2 + E_2 r_1 - I(r_1 r_2)$$

$$\therefore V = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2} - I\left(\frac{r_1 r_2}{r_1 + r_2}\right) \quad \text{--- (2)}$$

on comparing with eqn (1), $V = E - Ir$

We get

$$\boxed{E_{eq} = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2}} \quad \text{and}$$

$$\boxed{r_{eq} = \frac{r_1 r_2}{r_1 + r_2}}$$

Also, $I = \dfrac{E}{R + r} = \dfrac{\frac{E_1 r_2 + E_2 r_1}{r_1 + r_2}}{R + \frac{r_1 r_2}{r_1 + r_2}} \Rightarrow I = \dfrac{E_1 r_2 + E_2 r_1}{R(r_1 + r_2) + r_1 r_2}$

Q. 3

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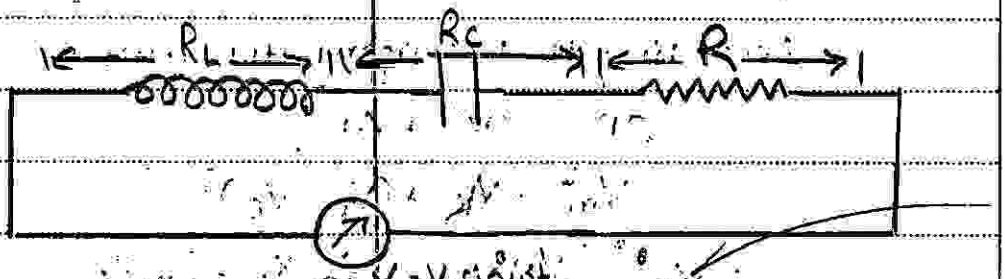
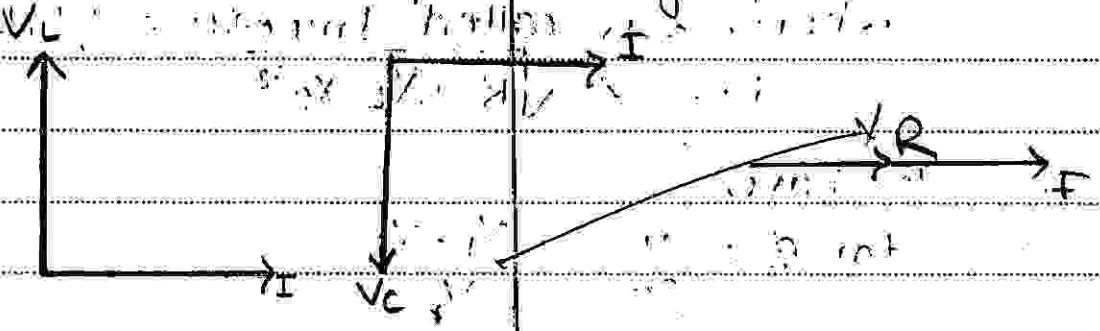
V).

30).

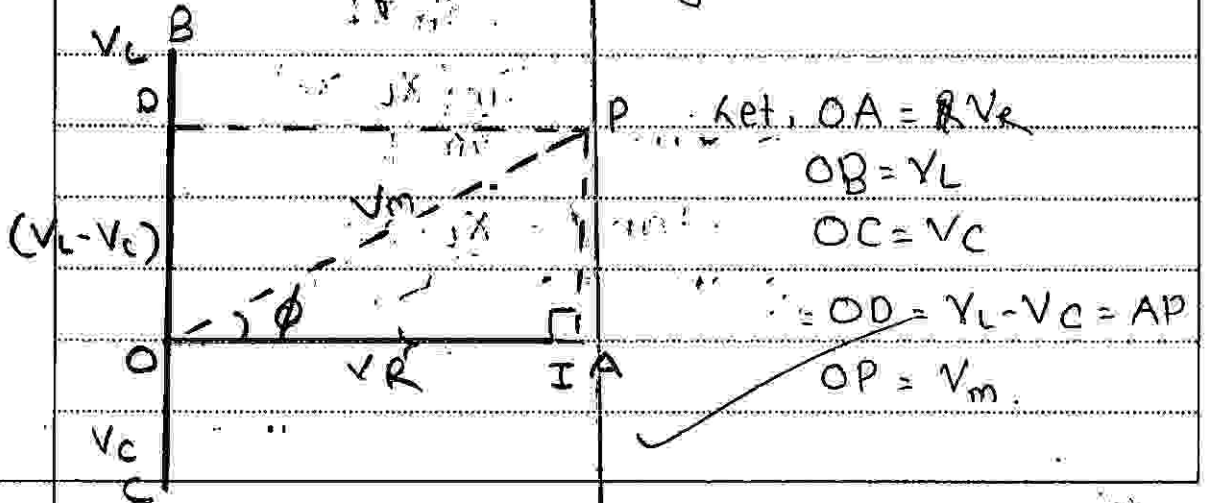


Consider a series LCR combination of Inductor, Capacitor and Resistance connected to an ac source. Let R_L, R_C & R be the effective resistance offered by LCR. Let X_L, X_C, and X_R be the effective opposition offered by them.

The individual phasor diagram are shown below,



The combined phasor diagram is -



Let, $OA = IV_R$

$OB = V_L$

$OC = V_C$

$\therefore OD = V_L - V_C = AP$

$OP = V_m$.

Consider Δ^{le} AOP,

According to Pythagoras theorem,

$$OP^2 = OA^2 + AP^2$$

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

$$\therefore V_m^2 = V_R^2 + (i_m X_L - i_m X_C)^2$$

$$= i_m^2 R^2 + i_m^2 (X_L - X_C)^2$$

$$V_m^2 = i_m^2 [R^2 + (X_L - X_C)^2]$$

$$\therefore V_m = \sqrt{i_m^2 [R^2 + (X_L - X_C)^2]}$$

$$\therefore V_m = i_m \sqrt{R^2 + (X_L - X_C)^2}$$

$$\therefore V_m = i_m Z$$

where, Z is called Impedence of LCR circuit

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

5 We have,

$$\tan\phi = \frac{AP}{OA} = \frac{V_L - V_C}{V_R}$$

$$= \frac{i_m X_L - i_m V_C}{i_m R}$$

$$= \frac{i_m (X_L - X_C)}{i_m R}$$

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

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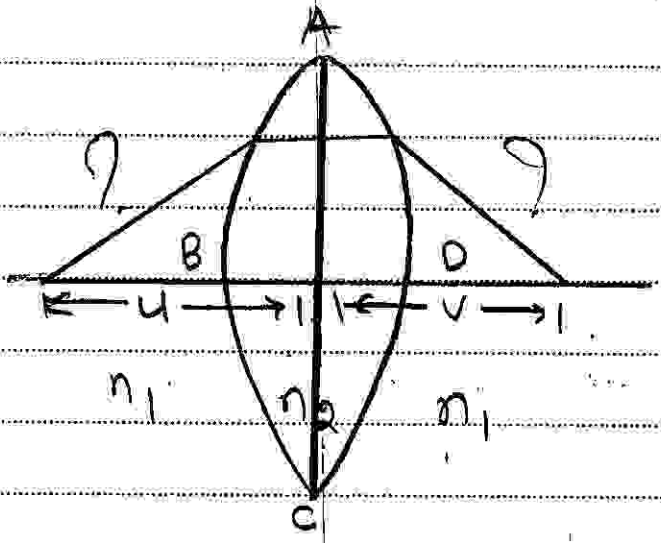
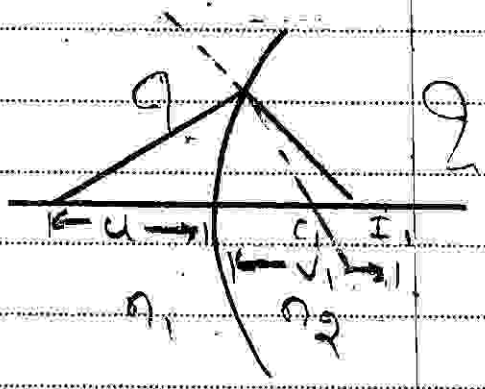
31). Len's maker formula: $\frac{1}{f} = (n_{21} - 1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$



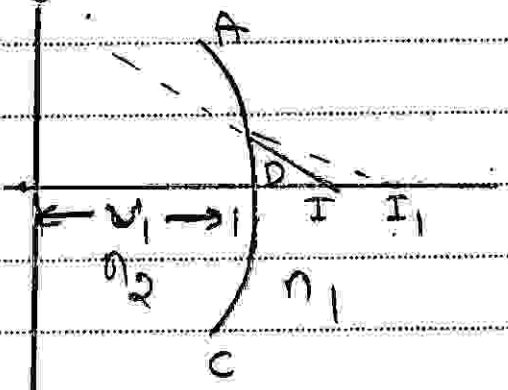
a). Refracting surface ABC.



Applying the relation for the refracting surface ABC, we have,

$$\frac{n_2}{v_1} - \frac{n_1}{u} = \frac{n_2 - n_1}{R_1} \quad \ldots (1)$$

b). Refracting surface ADC



Applying relation for refracting surface ABD, we have,

$$\frac{\eta_1}{v} - \frac{\eta_2}{v_1} = \frac{\eta_1 - \eta_2}{R_2} \quad \ldots (1)$$

$$= \frac{\eta_1}{v} - \frac{\eta_2}{v_1} = -\frac{(\eta_2 - \eta_1)}{R_2} \quad \ldots (2)$$

Adding (1) & (2),

$$\frac{\eta_2}{v_1} - \frac{\eta_1}{u} + \frac{\eta_1}{v} - \frac{\eta_2}{v_1} = \frac{\eta_2 - \eta_1}{R_1} - \frac{\eta_2 - \eta_1}{R_2}$$

$$\frac{\eta_1}{v} - \frac{\eta_1}{u} = (\eta_2 - \eta_1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

$$\therefore \eta_1\left(\frac{1}{v} - \frac{1}{u}\right) = \eta_1\left(\frac{\eta_2}{\eta_1} - 1\right)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

$$\boxed{\frac{1}{f} = (\eta_{21} - 1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]}$$

is called lens maker's formula.

$\because \frac{\eta_2}{\eta_1} = \eta_{21}$ & $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

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VI)

33) Given: $r = 5\text{ cm} = 5\times10^{-2}\text{ m}$

$d = 2\text{mm} = 2\times10^{-3}\text{ m}$.

$C = ?$

$U = ?$

$V = 200\text{ V}$.

$\varepsilon_0 = 8.854\times10^{-12}\text{ Fm}^{-1}$.

We have,

$$C = \frac{\varepsilon_0 A}{d}$$

$$\text{Area, } A = \pi r^2 = \frac{22}{7}\times(5\times10^{-2})^2 = 78.57\times10^{-4}.$$

$$= \frac{8.854\times10^{-12}\times78.5714\times10^{-4}}{2\times10^{-3}}$$

$$= \frac{695.671\times10^{-16+3}}{2}$$

$$C = 347.835\times10^{-13}\text{ F}.$$

$$C = 34.7835\times10^{-12}\text{ F}$$

$$\boxed{C = 34.78\text{ pF}}$$

Energy stored in the capacitor,

$$U = \frac{1}{2} CV^2$$

$$= \frac{1}{2} \times 34.78 \times 10^{-12} \times (200)^2$$

$$= \frac{1}{2} \times 34.78 \times 40000 \times 10^{-12}$$

$$U = 695600 \times 10^{-12} \text{ J.}$$

$$\therefore U = 695.6 \times 10^{-9} \text{ J.}$$

$$\boxed{U = 6.956 \times 10^{-7} \text{ J}}$$

34) Given: We have, $I = \frac{\mathcal{E}}{R+r} = \frac{\mathcal{E}}{R+0} = \frac{\mathcal{E}}{R}$

∴ When two resistors are connected in series,

i.e. $R_s = R_1 + R_2$, $I = 2A$. & $\mathcal{E} = 5V$.

$$\therefore 2 = \frac{5}{R_s} \quad \therefore 2 = \frac{5}{R_1 + R_2}$$

$$\therefore (R_1 + R_2)\, 2 = 5 \quad \therefore R_1 + R_2 = 5/2 \text{ ---- (1)}$$

When two resistors are connected in parallel,

i.e. $R_p = \frac{R_1 R_2}{R_1 + R_2}$, $\mathcal{E} = 5\ V$, $I = \frac{25}{3} A$.

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$$\therefore \frac{25}{3} = \frac{5}{\frac{R_1 R_2}{R_1 + R_2}}$$

$$\frac{25}{3} = \frac{5(R_1 + R_2)}{R_1 R_2}$$

$$\frac{25}{3} = \frac{25 \times 5}{R_1 R_2 \times 2} \quad \left(\because R_1 + R_2 = \frac{5}{2}\right)$$

$$\frac{25}{3} = \frac{25}{2R_1 R_2}$$

$$R_1 R_2 = \frac{3}{2}$$

$$2R_1 R_2 = 3$$

$$R_1 + R_2 = \frac{5}{2} \qquad R_1 R_2 = \frac{3}{2}$$

We have,

$$(R_1 - R_2)^2 = (R_1 + R_2)^2 - 4R_1 R_2$$

$$(R_1 - R_2)^2 = \left(\frac{5}{2}\right)^2 - 4 \times \frac{3}{2}$$

$$= \frac{25}{4} - 6 = \frac{25 - 24}{4}$$

$$(R_1 - R_2)^2 = \frac{1}{4}$$

$$R_1 - R_2 = \frac{1}{2} \qquad \ldots (2)$$

From (1) & (2)

$$R_1 + R_2 = \frac{5}{2}$$

$$R_1 - R_2 = \frac{1}{2}$$

$$2R_1 = \frac{5}{2} + \frac{1}{2}$$

$$2R_1 = 3$$

$$\boxed{R_1 = \frac{3}{2}\ \Omega}$$

From (1),

$$R_2 = \frac{5}{2} - R_1 = \frac{5}{2} - \frac{3}{2} = \frac{2}{2} = 1$$

$$\therefore \boxed{R_2 = 1\ \Omega}$$

∴ The value of resistances,

$R_1 = 3/2\ \Omega$ & $R_2 = 1\ \Omega$

5

5 ಪ್ರತಿ ಪುಟದ ಒಟ್ಟು ಅಂಕಗಳು

ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರು ಕಡ್ಡಾಯವಾಗಿ ಭರ್ತಿ ಮಾಡಿ ಸಹಿ ಮಾಡುವುದು.

ವಿದ್ಯಾರ್ಥಿ ನೋಂದಣಿ ಸಂಖ್ಯೆ: 7 7 7 9 3 7

ವಿದ್ಯಾರ್ಥಿ/ನಿ ಪಡೆದಿರುವ ಒಟ್ಟು ಪುಟಗಳ ಸಂಖ್ಯೆ	ಮುಖ್ಯ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಬರೆದಿರುವ ಒಟ್ಟು ಪುಟಗಳ ಸಂಖ್ಯೆ	ಹೆಚ್ಚುವರಿ ಹಾಳೆಯಲ್ಲಿ ಬರೆದಿರುವ ಒಟ್ಟು ಪುಟಗಳ ಸಂಖ್ಯೆ	ಬರೆದಿರುವ ಒಟ್ಟು ಪುಟಗಳ ಸಂಖ್ಯೆ	ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರ ಸಹಿ
26.	22	4	26	01/03

GOVERNMENT OF KARNATAKA
KARNATAKA STATE PRE-UNIVERSITY EDUCATION EXAMINATION BOARD
II YEAR P.U.C. EXAMINATION - MARCH - 2019

Answer Sheet No. 2518038 ADDITIONAL ANSWER SHEET

Reg. No. 7 7 7 9 3 7

Main Answer Book Sl. No. 2068048

Signature of the Invigilator with date 11.03

VI).

36).

Given: $\lambda = 5000\text{Å} = 5000 \times 10^{-10}$ m

$d = 2$ mm $= 2 \times 10^{-3}$ m.

$D = 1$ m.

β = fringe width = ?

We have,

$$\beta = \frac{\lambda D}{d}$$

$$= \frac{5000 \times 10^{-10} \times 1}{2 \times 10^{-3}}$$

$$\beta = 2500 \times 10^{-7} \text{ m}$$

$$= 0.25 \times 10^{-3} \text{ m}$$

$$\boxed{\beta = 0.25 \text{ mm}}$$

2 C

Distance of 7th dark fringe from central bright fringe,

$$= (2n - 1)\lambda$$

$$= (2(7) - 1)\lambda$$

$$= 13\lambda$$

$$= 13 \times 5000 \times 10^{-10}$$

$$= 65000 \times 10^{-10} \text{ m}$$

$$\boxed{x_7 = 6.5 \times 10^{-6} \text{ m}}$$

37). Half life of U-238, $T_{\frac{1}{2}} = 4.5 \times 10^9$ years.

$A = ?$ $\quad A = \frac{dN}{dt} = \lambda N.$

We know that,

$$\lambda = \frac{0.693}{T_{\frac{1}{2}}}$$

$$= \frac{0.693}{4.5 \times 10^9 \times 365 \times 24 \times 60 \times 60}$$

$$= \frac{0.693}{141912000 \times 10^9}$$

$$= 0.000000000488 \times 10^{-9}$$

$$\lambda = 4.88 \times 10^{-18}\ s^{-1}$$

According to Avagadro's principle law,
1 g of U-238 contains 6.625×10^{24} no. of atoms.

$\therefore N = 6.625 \times 10^{24}$

$\therefore$ Activity, $A = \lambda N$

$= 4.88 \times 10^{-18} \times 6.625 \times 10^{24}$

$A = 32.33 \times 10^6$ Bq

$\boxed{A = 3.233 \times 10^7 \text{ Bq}}$

or. $A = \frac{3.233 \times 10^7}{3.7 \times 10^{10}}$ Ci

$\boxed{A = 8.7378 \times 10^{-3} \text{ Ci}}$

3

Contd

23). Experimental observations of photoelectric effect.

According to Einstein's photoelectric equation, we have,

$$E = \phi + K_{max}$$

$$h\nu = h\nu_0 + K_{max}$$

$$\therefore K_{max} = h(\nu - \nu_0) \quad \ldots (1).$$

i) When, $\nu = \nu_0$, According to eqn, $\nu = 0$.
∴ There is no kinetic energy and hence photoelectric emission occurs.

ii) When $\nu < \nu_0$, According to eqn (1), $(\nu - \nu_0)$ will be negative & hence, K_{max} is negative.
photoelectric effect does not occurs.

iii) When $\nu > \nu_0$, According to eqn (1)
K_{max} is positive
Hence, photoelectric emissions occurs instantly.

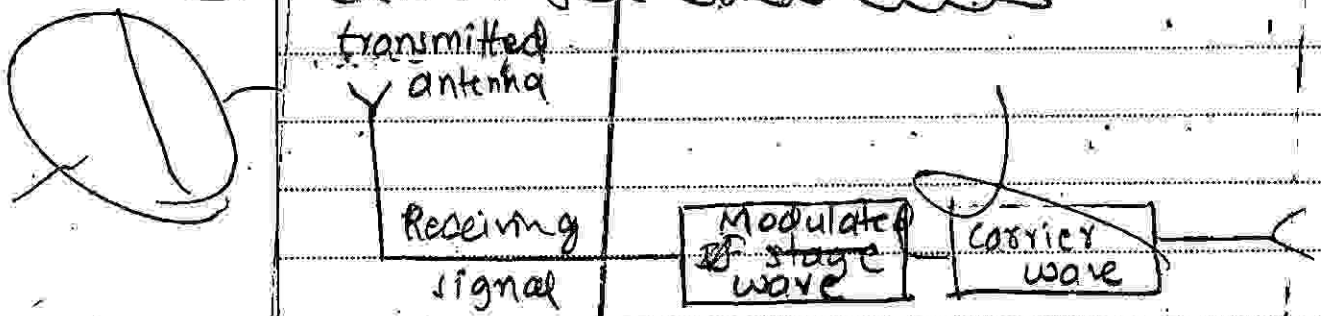
iv). Intensity of a ph is the no. of photons emitted on the surface. Here, if the

P.T.O.

intensity is increased, no of photons will also be increased, then no of electrons will also be increased. Hence, increase in intensity will increase the photoelectric effect

26). Modulation: It is the process of superimposing of low frequency wave called modulated wave to high frequency of carrier wave.

Block diagram of the receiver.



VI).

35). Given: $l = 3m$. $B = 100T$. $d = 70m$. $t = 5sec$.
$\theta = 30°$. $e = ?$

I). 1). Position of the object should be beyond F.

ii) $E_n = n^2 \left(\frac{h^2}{4\pi^2 e^2 m \theta}\right)$