GOVERNMENT OF KARNATAKA

DEPARTMENT OF PRE UNIVERSITY EDUATION EXAMINATION BOARD

II P U C Annual examination March – 2017

SCHEME OF VALUATION

PHYSICS (33) (New Syllabus)

I		***PART-A***	
	1	The force between two point charges is directly proportional to product of the magnitudes of the charges and inversely proportional to the square of the distance between them. **OR** In mathematical form**.**	1
	2	It is the ratio of drift velocity of free electrons to the applied electric field **OR** It is the drift velocity of free electrons per unit electric field.	1
	3	Law of conservation of energy. **OR** It gives the polarity of the induced emf. **OR** It gives the direction of the induced current.	1
	4	It is the current due to changing electric field/ flux (inside the capacitor) with time is called displacement current. **OR** It is the product of permittivity of free space and the rate of change of electric flux.	1
	5	Microwaves are used 1. in Radar system for aircraft navigation 2. in microwave ovens for heating 3.to measure the speed of tennis ball, cricket ball, automobile . ***(Any other relevant use should be considered)*** *(Any one)*	1
	6	Inversely **OR** P = $\frac{1}{f}$	1
	7.	$\lambda = \frac{h}{mv}$ **OR** $\lambda = \frac{h}{p}$ **OR** $\lambda = \frac{h}{\sqrt{2mK}}$ **OR** $\lambda = \frac{h}{\sqrt{2meV}}$	1
	8.	Wave nature of electron.	1
	9	Becquerel **OR** Bq **OR** disintegration /sec **OR** decay /sec.	1
	10	A device that converts one form of energy (signal) into another.	1
II		***PART- B***	
	11	1. Electric Field lines start from positive charge and ends at negative charge. 2. They never intersect each other. 3. They do not form any closed loops. 4. In a charge free region, electric field lines are continuous curves without any breaks. 5. The tangent drawn to the field line gives the direction of the electric field. (***Any other correct property should be considered***) *(Any two)*	1+1
	12	1.Area of each plate 2.Distance between the plates 3. Dielectric constant of the medium between the plates (nature of the medium between the plates) *(Any two)*	1+1

13 Current through the conductor is directly proportional to the potential difference across its ends provided temperature and other physical quantities remain constant. **1**

If current I is flowing through the conductor and let V be the potential difference between the ends of the conductor. **1**

$V \propto I$ **or** $I \propto V$ $V = IR$

14 i) **Magnetic declination :** The angle between the true geographic north and the north shown by a compass needle. **1**

OR

The angle between the geographic meridian and magnetic meridian.

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ii) Inclination or Dip: The angle made by a magnetic needle with horizontal in the magnetic meridian. **OR** **1**

The angle between the earth's total magnetic field and its horizontal component.

15 The magnitude of the induced emf in a circuit is equal to the time rate of change of magnetic flux through the circuit.

OR

The magnitude of the induced emf in a circuit is directly proportional to the rate of change of magnetic flux linked with the circuit. **1**

If $d\phi_B$ is the change in magnetic flux in time dt, then induced emf is **1**

$$\varepsilon = -\frac{d\phi_B}{dt}$$

16 i) Concave lens **1**

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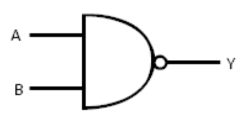
ii) Convex lens **1**

17 It is an AND gate followed by a NOT gate. **OR**

Logic gate whose output zero(0) only when both the inputs are one(1). **OR** **1**

Inputs		Output
A	B	$Y = \overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0



1

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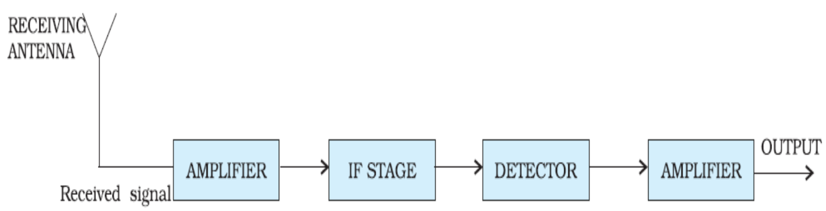

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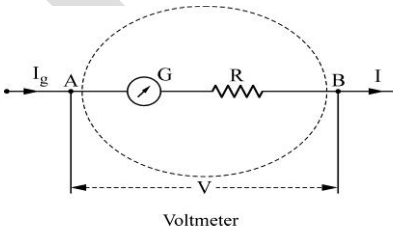
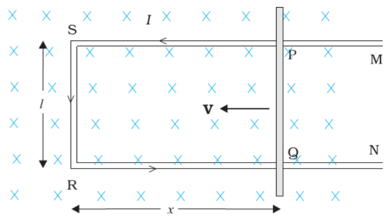
III		***PART - C***	
	19	Figure with directions and finding workdone. **OR** The work done to move a unit positive charge from one point to another point against the field $\vec{E}$ through a displacement $\vec{dl}$ is $$dW = \vec{E}.\vec{dl} = -Edl$$ --- This is equal to the potential difference dV , therefore $$dV = dW$$ --- $$dV = -Edl \quad \boldsymbol{OR} \quad E = -\frac{dV}{dl}$$	1 1 1
	20	The work done to move a small charge dq from one plate to another plate is $$dW = Vdq = \frac{q}{C}\, dq$$ --- The total work done in transferring total charge$Q$ $$W = \int_0^Q dW = \int_0^Q \frac{q}{C} dq = \frac{Q^2}{2C} = \frac{1}{2}\frac{Q^2}{C}$$ --- This work done is stored as energy U in the charged capacitor $$U = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}QV = \frac{1}{2}CV^2$$	1 1 1
	21	A galvanometer can be converted into a voltmeter by connecting a high resistance in series with it. ---  --- In figure, p.d. across AB is $V = (R + G)I_g$ $$R = \frac{V}{I_g} - G$$ ***(Alternate correct explanation should be considered)***	1 1 1

	22	***(Figure OR Explanation)***  The rod of length l is moved through a distance x with constant velocity 'v' perpendicular to the uniform magnetic field B . --- The magnetic flux ϕ_B enclosed by the loop is ϕ_B = B $\times$ area of the loop ϕ_B = B l x --- According to Faraday's law, induced emf in the coil is $\varepsilon = -\frac{d\phi_B}{dt}$ $\varepsilon = -\frac{d(Blx)}{dt}$ ε= B l v [because $-\frac{dx}{dt} = v$] ***(Alternate correct method should be considered)***	1 1 1
	23	It is a device used to increase or decrease the AC voltages. --- 1.Magnetic flux leakage loss 2. Ohmic loss / loss due to the resistance of the windings (turnings) / joules heat loss 3. Eddy current loss 4. Hysteresis loss *(Any two)*	1 1+1
	24	1.In sunglasses 2. In liquid crystal display 3. To view 3-D pictures 4. Automobile head lights (***Any other correct application should be considered)*** ***Note: One application $\rightarrow$ 1 mark , Two/Three applications $\rightarrow$ 3 marks.***	3
	25	1. The photoelectric emission is an instantaneous process. 2. For every photo emissive material , there exists a minimum frequency of radiation below which there is no photoelectric emission. This minimum frequency is called threshold frequency (ν_0) 3. Above the threshold frequency, the photocurrent is directly proportional to the intensity of incident radiation. 4. Above the threshold frequency, the maximum kinetic energy of the photo electrons is directly proportional to the frequency of incident radiation. 5. The photoelectric current increases with increase in collector plate voltage and reaches a saturation value. 6. The photocurrent decreases with increase in negative potential and reaches zero at a negative potential known as stopping potential. *(Any three)* **(OR *Relevant graphs should be considered)***	1+1+1

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n-type semiconductor	p-type semiconductor
(1) Obtained by doping pentavalent impurity to a pure semiconductor.	(1) Obtained by doping trivalent impurity to a pure semiconductor.
(2) Majority charge carriers are free electrons.	(2) Majority charge carriers are holes.
(3) Minority charge carriers are holes.	(3) Minority charge carriers are free electrons.
(4) At 0K only free electrons are available for conduction.	(4) At 0K only holes are available for conduction.
(5) Donor energy level is slightly below the bottom of conduction band.	(5) Acceptor energy level is slightly above the top of valance band.
(6)Impurity atom is called donor impurity.	(6)Impurity atom is called acceptor impurity.

(Any three) — 1+1+1

IV — ***PART –D***

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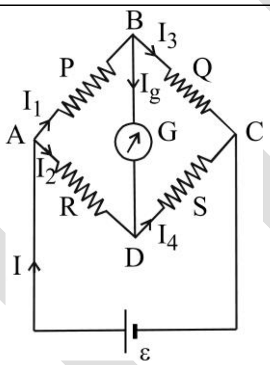


— 1

Let I_1, I_2, I_3, I_4 and I_g be the currents through the resistances P, R, Q, S and G respectively as shown in figure.

Applying KVL to the mesh ABDA we get,

$$I_1P + I_gG - I_2R = 0 \quad \ldots (1)$$

Applying KVL to the mesh BCDB we get,

$$I_3Q - I_4S - I_gG = 0 \quad \ldots (2)$$

— 1

The network is balanced, If $I_g = 0$ then — 1

At B, $I_1 = I_3$

At D, $I_2 = I_4$ ..... (3)

— 1

Equation (1) and (2) becomes,

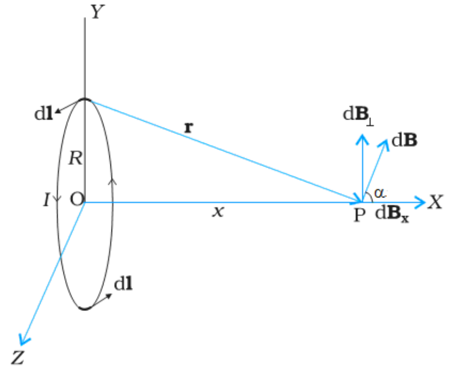
$$I_3P = I_4R \quad \ldots (4)$$

$$I_3Q = I_4S \quad \ldots (5)$$

Equation $(4) \div (5)$ we get, $\dfrac{P}{Q} = \dfrac{R}{S}$ — 1

(Alternate correct method should be considered)

28



1

From Biot-Savart's law,

Since $dl \perp r$, then $\sin\theta=1$, $\therefore\ dB = \frac{\mu_o}{4\pi}\frac{Idl}{r^2}$ 1

But $r^2 = x^2 + R^2$,

$$dB = \frac{\mu_o}{4\pi}\frac{Idl}{\left(x^2+R^2\right)}$$

The direction of dB is α as shown, and it has x-component dB_x and y-component $dB_\perp$.

But $\Sigma dB_\perp = \Sigma dB\sin\alpha = 0$ [since, each $dB_\perp$ due to diagonally opposite Idl vanish]. 1

Thus, the net magnetic field at P is $B = \Sigma dB_x = \Sigma dB\cos\alpha$

But $\cos\alpha = \frac{R}{r} = \frac{R}{\left(x^2+R^2\right)^{\frac{1}{2}}}$

$\therefore$ Total field $B = \sum dB_x = \sum \frac{\mu_o Idl}{4\pi}\frac{R}{\left(x^2+R^2\right)^{\frac{3}{2}}}$ 1

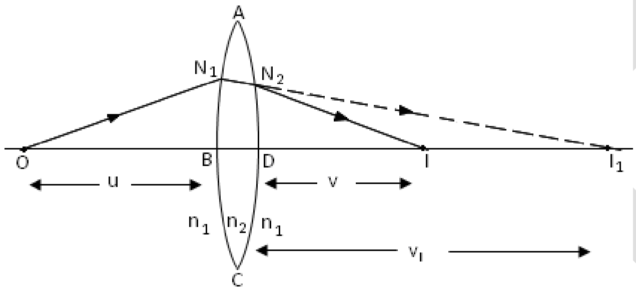
$$B = \frac{\mu_o}{4\pi}\frac{IR}{\left(x^2+R^2\right)^{\frac{3}{2}}}\sum dl$$

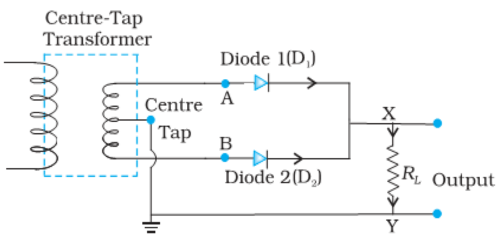
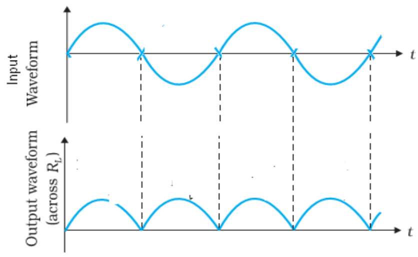
$\sum dl$ = circumference = $2\pi R$

Thus, $B = \frac{\mu_o}{4\pi}\frac{IR}{\left(x^2+R^2\right)^{\frac{3}{2}}} x 2\pi R$ 1

$$B = \frac{\mu_o IR^2}{2\left(x^2+R^2\right)^{\frac{3}{2}}}$$

(Alternate correct method should be considered)

	29	1. They are strongly attracted by magnetic field. 2. They are strongly magnetized in the direction of the external magnetic field. 3. The magnetic field lines are highly concentrated inside the substance. 4. χ is large positive 5. $\mu_r >> 1$ 6. Above the curie temperature, its susceptibility is varies inversely proportional to the excess of temperature. 7. They exhibits magnetic hysteresis. (***Any other correct property should be considered)*** *(Any five)*	1+1+1+ 1+1
V			
	30	 *Using refraction formula* *for the first interface ABC,* $\frac{n_1}{-u}+\frac{n_2}{v_1}=\frac{n_2-n_1}{R_1}$ *----(1)* *Similarly for the second interface ADC,* $\frac{n_2}{-v_1}+\frac{n_1}{v}=\frac{n_1-n_2}{R_2}$ $\frac{n_2}{-v_1}+\frac{n_1}{v}=\frac{n_2-n_1}{-R_2}$ *--------------(2)* *Adding (1) and (2), we get* $\frac{n_1}{-u}+\frac{n_1}{v}=(n_2-n_1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ *---------(3)* *Suppose the object is at infinity, i.e u* $\rightarrow\infty$ *and v = f.* *Then,* $\frac{n_1}{f}=(n_2-n_1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ *On diving both sides by* n_1, *we get* $\frac{1}{f}=\left(\frac{n_2}{n_1}-1\right)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ *or* $\frac{1}{f}=(n_{21}-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ ***(Alternate correct method should be considered)***	1 1 1 1 1

	31	The rate of decay $\propto$ number of undecayed nuclei in the sample. **OR** The rate of disintegration of a radioactive sample at any instant of time is directly proportional to the number of atoms present in it at that instant. $\frac{dN}{dt} \propto N$	1
		i.e $\frac{dN}{dt} = -\lambda N$; here N is the number of radioactive nuclei present in the sample at an instant $\therefore \frac{dN}{N} = -\lambda dt$	1
		Now, on integrating both sides we get $\int_{N_0}^{N} \frac{dN}{N} = -\lambda \int_0^t dt$; where N_o is the number of radioactive nuclei at t =0	1
		$\ln N - \ln N_o = -\lambda t$ $\ln\left(\frac{N}{N_o}\right) = -\lambda t$	1
		$N = N_o e^{-\lambda t}$ ***(Alternate correct method should be considered)***	1
	32	The process of conversion of AC into DC.	1
			1+1
		During the positive half cycle of AC input, A is positive with respect to B. The diode D_1 is forward biased and D_2 is reverse biased. As a result D_1 conducts while D_2 does not. Hence a current flows through R_L.	1
		During the negative half cycle of AC input A is negative with respect to B. The diode D_1 is reverse biased and D_2 is forward biased. As a result D_2 conducts while D_1 does not. Hence a current flows through R_L.	1

VI			
	33	Figure	1
		$E = \frac{1}{4\pi\varepsilon_o}\frac{Q}{r^2}$	1
		$E_A = E_B = 2700 \times 10^3$ OR $= 2.7 \times 10^6$ N/C	1
		Resultant field $E_R = E_A + E_B = 5.4 \times 10^6$ N/C along AB	1
		Force, $F = E q = 8.1 \times 10^{-3}$ N along BA	1
		(Alternate correct method should be considered)	
	34	$I = \frac{\varepsilon}{R+r}$ **OR** $R = \frac{V}{I}$	1
		Case (1) $R_s = \frac{2}{2/5} = 5\Omega$	1
		Case (2) $R_p = \frac{2}{5/3} = \frac{6}{5}\Omega$	1
		Simplification	1
		Arriving at $R_1 = 3\Omega$ and $R_2 = 2\Omega$	1
		(Alternate correct method should be considered)	
	35	$X_L = 2\pi\nu L = 31.4\ \Omega$	1
		$X_c = 1/2\pi\nu C = 106.1\ \Omega$	1
		Since , $X_c > X_L$ current leads the voltage **OR** Voltage lags the current	1
		$\tan\Phi = \frac{X_C - X_L}{R} = 0.3734$	1
		$\Phi = 20.5^0$ (Since Φ is positive, current leads the voltage)	1
		(Alternate correct method should be considered)	

	36	$$\beta = \frac{\lambda D}{d}$$	1
		$$\beta_1 = \frac{\lambda_1 D_1}{d}, \qquad \beta_2 = \frac{\lambda_2 D_2}{d}$$	1
		$$\frac{\beta_1}{\beta_2} = \frac{\lambda_1 D_1}{\lambda_2 D_2}$$	1
		Substitution and simplification	1
		Arriving upto $\lambda_2 = 8000A^0$ ***(Alternate correct method should be considered)***	1
	37	$$\frac{1}{\lambda_1} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$	1
		For I member of Balmer series, $n_1 = 2$ & $n_2 = 3$, $\lambda_1 = 6563\ A^0$ $$\frac{1}{\lambda_1} = R\left(\frac{1}{4} - \frac{1}{9}\right) = \frac{5R}{36}$$	1
		For II member of Balmer series, $n_1 = 2$ & $n_2 = 4$ $$\frac{1}{\lambda_2} = R\left(\frac{1}{4} - \frac{1}{16}\right) = \frac{3R}{16}$$	1
		Arriving at $\lambda_2 = 4861\ A^0$	1
		$\nu = c / \lambda_2 = 6.17X10^{14}$ Hz ***(Alternate correct method should be considered)***	1

NOTE: ***Any alternate correct answers should be considered.***

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