M.M.A

HIGHER SECONDARY SCHOOL - PAPPANADU

12TH PHYSICS - HALF YEARLY EXAM ANSWER KEY – 2017-2018

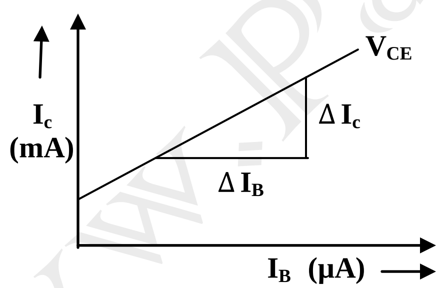
STD : XII - EM

PART - I

Sl. No.	Answer	Sl. No.	Answer
1.	(a) $C^2 N^{-1} m^{-2}$	16.	(c) sommerfeld
2.	(c) 4 m	17.	(a) (a) 6×10^{18} Hz
3.	(a) zero volt and zero V/m	18.	(b) (b) continuous spectrum
4.	(c) $\frac{\sigma}{\varepsilon_0}$	19.	(a) 1 : 25
5.	(c) $n^2 : 1$	20.	(d) charge
6.	(d) 0^o	21.	(a) $h(\upsilon - \upsilon_0)$
7.	(a) 1: 1	22.	(d) $_8O^{16}$, $_6C^{14}$
8.	(b) capacitor	23.	(d) neutron number decreases by one
9.	(a) 0	24.	(b) 34
10.	(a) zero	25.	(b) 200 MeV
11.	(d) brushes	26.	(a) collition
12.	(c) diffraction pattern becomes narrower and crowded together	27.	(a) an amplifier with feedback
13.	(c) partially polarized	28.	(a) $A + B + \overline{C} + \overline{D}$
14.	(b) an odd multiple of π	29.	(a) the amplitude of carrier wave varies in accordance with the amplitude of the modulating signal
15.	(c) 6000 Å and 5980 Å	30.	(a) to avoid flicker in the picture

Part – II

31.	**Applications of capacitors:** (i) used in the ignition system of automobile engines to eliminate sparking. (ii) used to reduce voltage fluctuations in power supplies and to increase the efficiency of power transmission. (iii) used to generate electromagnetic oscillations and in tuning the radio circuits.	-----1 mark -----1 mark -----1 mark
32.	**V=** $\frac{1}{4\pi\varepsilon_0}\frac{q_1}{r}$ $= 9\times10^9 \times \frac{4\times10^{-7}}{0.09}$ V = 4 x 10^4 V	-----1 mark -----1 mark -----1 mark
33.	**State Kirchoff's voltage law** Kirchoff's voltage law states that, the algebraic sum of the products of resistance and current in each part of any closed circuit is equal to the algebraic sum of the emf's in that closed circuit	3 mark
34.	**Distinguish between electric power and electric energy.** Electric power is defined as the rate of doing electric work. Its unit is watt. Electric energy is defined as the capacity to do work. Its unit is joule.	-----1 mark -----½ mark -----1 mark -----½ mark
35.	**R=** $\frac{V}{I}$ $= \frac{240}{0.5}$ **R=480 Ω**	-----1 mark -----1 mark -----1 mark
36.	**State Joule's law.** H = I^2Rt (i) directly proportional to the square of the current for a given R (ii) directly proportional to resistance R for a given I (iii) directly proportional to the time of passage of current	-----1 mark -----1 mark -----1 mark
37.	**Define rms value of alternating current.** The rms value of alternating current is defined as that value of the steady current, which when passed through a resistor for a given time, will generate the same amount of heat as generated by an alternating current when passed through the same resistor for the same time.	3 mark
38.	M $= \frac{-e}{dI/dt} = \frac{-e}{(I_2 - I_1)/dt}$ $= \frac{-50\times10^{-3}}{(8-4)/0.5}$ **=6.25 m H**	-----1 mark -----1 mark -----1 mark
39.	**Define Rayleigh scattering law.** The amount of scattering is inversely proportional to the fourth power of the wave length.	3 mark
40.	**Define optic axis of a crystal.** Inside the crystal there is a particular direction in which both the ordinary and extra ordinary rays travel with same velocity. This direction is called optic axis of the crystal.	3 mark

41.	$v = \frac{E}{B}$ $= \frac{3.4\times10^4}{2\times10^{-3}}$ **V = 1.7 x 10 ^{7} m s $^{-1}$**	-----1 mark -----1 mark -----1 mark
42.	**Give the principle of Millikan's oil drop experiment.** It is based on the study of the motion of uncharged oil drop under free fall due to gravity and charged oil drop in a uniform electric field.By adjusting uniform electric field suitably, a charged oil drop can be made to move up or down or even kept balanced in the field of view for sufficiently long time and a series of observations can be made.	3 mark
43.	**Define stopping potential.** The minimum negative potential given to the anode for which the photo electric current becomes zero is called the stopping potential	3 mark
44.	**What are the uses of nuclear reactors?** 1. are mostly aimed at power production. 2. are useful to produce radio isotopes. 3. act as a source of neutrons, hence used in the scientific research.	-----1 mark -----1 mark -----1 mark
45.	**Write short note on Leptons?** Leptons are lighter particles having mass equal to or less than about 207 times the mass of an electron except neutrino and antineutrino. This group contains particles such as electron, positron, neutrino, antineutrino, positive and negative muons.	----1 ½ Marks ----1 ½ Marks
46.	$A_f = \frac{A}{1+A\beta}$ $= \frac{100}{1+(100\times0.05)}$ A_f **= 16.66**	-----1 mark -----1 mark -----1 mark
47.	**Write any three uses of CRO.** (i) It is used to measure a.c and d.c voltage. (ii) It is used to study the waveforms of a.c voltages. (iii) It is used to find the frequency of a.c voltage.	-----1 mark -----1 mark -----1 mark
48.		3 mark
49.	**What are universal gates? Why are they called so?** NAND and NOR gates are called universal gates because they can perform all the three basic logic functions. Basic logic gates NOT, OR, and AND using NAND and NOR gates.	3 mark
50.	**What is meant by skip distance?** In the sky wave propagation, for a fixed frequency, the shortest distance between the point of transmission and the point of reception along the surface is known as the skip distance.	3 mark

Part – III

51.	Work done is stored as electrostatic potential energy dw = V dq $dw = \frac{q}{C} dq$ $w = \int_0^q \frac{q}{C} dq$ $U = \frac{1}{2}\frac{q^2}{C}$ (or) $\frac{1}{2}CV^2$	-----1 mark -----1 mark -----1 mark -----1 mark -----1 mark
52.	Diagram V=IR V=E-Ir (or) Ir = E- V $\frac{Ir}{IR} = \frac{E-V}{V}$ **r =** $\left(\frac{E-V}{V}\right)R$	-----1 mark -----1 mark -----1 mark -----1 mark -----1 mark
53.	$R_s = R_1 + R_2 + R_3 = 5+3+2 = 10\ \Omega$ $I = \frac{V}{R} = \frac{10}{10} = 1$ A $V_1 = I R_1 = 1 \times 5 = 5$ V $V_2 = I R_2 = 1 \times 3 = 3$ V $V_3 = I R_3 = 1 \times 2 = 2$ V	-----1 mark -----1 mark -----1 mark -----1 mark -----1 mark
54.	Diagram By connecting low resistance in parallel with it large portion of the current passes through the low resistance $S = \frac{G.I_g}{I - I_g}$ $R_a = \frac{GS}{G+S}$ Ammeter does not appreciably change the resistance and current in the circuit ideal ammeter has zero resistance	-----1 mark -----1 mark -----1 mark -----1 mark -----1 mark
55.	**Faraday's laws of electromagnetic induction.** **First law** : Whenever the amount of magnetic flux linked with a closed circuit changes an emf is induced in the circuit. The induced emf lasts so long as the change in magnetic flux continues. **Second law** : The magnitude of emf induced in a closed circuit is directly proportional to the rate of change of magnetic flux linked with the circuit. **Lenz's law in electromagnetic induction.** Lenz's law states that the induced current produced in a circuit always flows in such a direction that it opposes the change or cause that produces it.	----1 ½ Marks ----1 ½ Marks ----3 Marks

56.	$\beta = \frac{\lambda D}{d}$ (or) $d = \frac{CD}{\nu\beta}$	-----1 mark
	$= \frac{3\times10^{8}\times1.5}{6\times10^{14}\times0.75\times10^{-3}}$	-----1 mark
	$= \frac{4.5\times10^{8}}{4.5\times10^{-11}}$ (calculation)	-----2 mark
	$= 10^{-3}$ m (or) = 1 mm	-----1 mark
57.	Any five properties of X –rays	-----5 mark
58.	Explain by Quantum theory	-----½ mark
	(i) Work function (ii) Energy of the incident photon = work function + kinetic energy of the electron	-----1 mark
	$h\upsilon = W + \frac{1}{2}mv^2$	-----1 mark
	If the electron does not lose energy by internal collisions, $h\upsilon = W + \frac{1}{2}mv^2_{max}$	-----1 mark
	$h\upsilon_0 = W$	-----½ mark
	$h(\upsilon - \upsilon_0) = \frac{1}{2}mv^2_{max}$	-----1 mark
59.	Diagram	-----1 mark
	$l = l_0\sqrt{1-\frac{v^2}{c^2}}$	-----1 mark
	$l < l_0$	-----½ mark
	contracted by a factor $\sqrt{1-\frac{v^2}{c^2}}$	-----1 mark
	example	-----½mark
60.	Mass of the reactants= 26.981535+2.014102 = 28.995637 amu	-----1 mark
	Mass of the products = 24.98584+4.002604 = 28.988444 amu	-----1 mark
	Δm = 28.995637 – 28.988444 = 0.007193 amu	-----1 mark
	1 amu = 931 MeV	-----1 mark
	Energy released = 0.007193 x 931 = 6.697 MeV	-----1 mark
	(OR)	
	Energy per fission = 200 MeV = = 200 x 10^{6} x 1.6 x 10^{-19} J= 32 X 10^{-12} J	-----2 mark
	Energy per fission x N = Total energy released per second	-----1 mark
	The required number of fissions per second $N = \frac{32\times10^{6}}{32\times10^{-12}}$	-----1 mark
	N = 1 X 10^{18} fission per second	-----1 mark

61.	Graph	-----1 mark
	Gain decrease at very low and very high frequencies	-----1 mark
	Lower cut off frequency (f_L) is defined as the frequency in the low frequency range at which the gain of the amplifier is $1/\sqrt{2}$ times the mid frequency gain (A_M).	-----1 mark
	Upper cut off frequency (f_U) is defined as the frequency in the high frequency range at which the gain of the amplifier is $1/\sqrt{2}$ times the mid frequency gain (A_M).	-----1 mark
	Band width defined as the frequency interval between lower cut off and upper cut off frequencies. $BW = f_U - f_L$	-----1 mark
62.	**Advantages of digital communication**	
	i) The transmission quality is high and almost independent of the distance between the terminals.	-----1 mark
	ii) The capacity of the transmission system can be increased.	-----1 mark
	iii) The newer types of transmission media such as Light beams in optical fibers and wave guides operating in the microwave frequency extensively use digital communication.	-----1 mark
	Disadvantages of digital communication	
	(i)A digital system requires larger bandwidth.	-----1 mark
	(ii) It is very difficult to gradually change over from analog to digital transmission.	-----1 mark

Part – IV

63.	**Electric field due to an electric dipole at a point on its equatorial line :**	
	Diagram	-----1 mark
	$E_1 = \frac{1}{4\pi\varepsilon_0}\frac{q}{(r^2+d^2)}$ along BP	-----1 mark
	$E_2 = \frac{1}{4\pi\varepsilon_0}\frac{q}{(r^2+d^2)}$ along PA	-----1 mark
	The vertical components $E_1 \sin\theta$ and $E_2 \sin\theta$ are equal and opposite, therefore they cancel each other	-----1 mark
	$E = 2E_1 \cos\theta$	-----1 mark
	$(\because E_1 = E_2)$	-----1 mark
	Up to $E = \frac{1}{4\pi\varepsilon_0}\frac{P}{(r^2+d^2)^{3/2}}$	-----2 mark
	$\therefore E = \frac{1}{4\pi\varepsilon_0}\frac{p}{r^3}$	-----1 mark
	The direction of E is along PR, parallel to the axis of the dipole and directed opposite to the direction of dipole moment	-----1 mark

64.	Diagram Explanation $\vec{F} = q(\vec{v}\times\vec{B})$ F = B q v Bqv = $\frac{mv^2}{r}$ r = $\frac{mv}{Bq}$ $\omega = \frac{Bq}{m}$ T = $\frac{2\pi}{\omega}$ T = $\frac{2\pi m}{Bq}$ ω and T not depends v and r	-----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark
65.	Explanation Principle - Electro magnetic induction $\frac{E_s}{E_P} = \frac{N_s}{N_p}$ For an ideal transformer, input power = output power $E_p I_p = E_s I_s$, up to $\frac{E_s}{E_P} = \frac{N_s}{N_p} = \frac{I_P}{I_S} = k$ For step up transformer k >1 and For step down transformer k < 1 Efficiency of transformer.	-----1 mark -----1 mark -----1 mark -----1 mark -----2 mark -----1 mark -----1mark -----2 mark
66.	Diagram Explanation $\frac{\sin i}{\sin r} = \frac{(BC/AC)}{(AD/AC)} = \frac{BC}{AD} = \frac{C_m t}{C_a t} = \frac{C_m}{C_a}$ (i) AD < AC - Explanation (ii) AD = AC - Explanation Critical angle definition (iii) AD > AC - Explanation Total internal reflection definition	-----3 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark

67.	Diagram Principle Experimental arrangement Determination v, $v = \frac{E}{B}$ $y_1 = \frac{1}{2}\left(\frac{Ee}{m}\right)\left(\frac{l}{v}\right)^2$ $Y = K\frac{1}{2}\left(\frac{e}{m}\right)\frac{l^2B^2}{E}$ Up to $\frac{e}{m} = \frac{2yE}{Kl^2B^2}$ $\frac{e}{m} = 1.7592 \times 10^{11}\ C\ kg^{-1}$	-----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----2 mark -----1 mark
68.	**Radioactive law of disintegration :** The rate of disintegration at any instant is directly proportional to the number of atoms of the element present at that instant (or) $\frac{-dN}{dt} \propto N$ $\log_e N = -\lambda t + C$ $t = 0, N = N_0 \therefore \log_e N_0 = C$ $N = N_0\ e^{-\lambda t}$ Graph An infinite time is required for the complete disintegration of all the atoms. **Half life period :** Half life period statement at, $t = T_{½}$, $N = \frac{N_0}{2}$ $\log_e 2 = \lambda T_{½}$ up to $T_{1/2} = \frac{0.6931}{\lambda}$	-----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----1 mark -----2 mark
69.	Diagram Explanation $i_1 + i_2 = i_f$ $\frac{V_1}{R_1} + \frac{V_2}{R_2} = -\frac{V_{out}}{R_f}$ $V_{out} = -\left(\frac{R_f}{R_1}V_1 + \frac{R_f}{R_2}V_2\right)$ $R_1 = R_2 = R_f = R$ $V_{out} = -(V_1 + V_2)$	-----2 mark -----1 mark -----1 mark -----1 mark -----2 mark -----1 mark -----1 mark -----1 mark
70.	**Diagram** **AF section** **RF section**	-----5 mark -----2 mark -----3 mark

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