SECOND YEAR HIGHER SECONDARY MODEL EXAMINATION, MARCH 2022

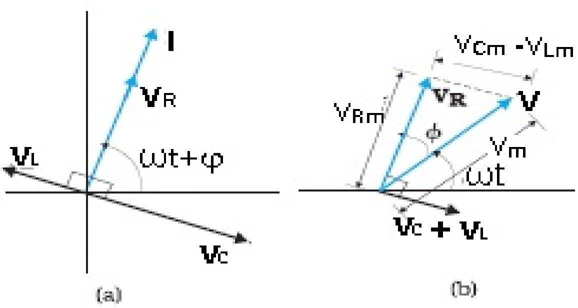
Part III

PHYSICS

Maximum: 60 Score

ME- 524
Date: 16.03.2022

HSPTA KANNUR **ANSWER KEY (unofficial)**

Qn No.	Qn Sub No.	Scoring Indicators	Split score	Total
1		Coulomb μ	1	1
2	(c)	90	1	1
3	(b)	p =h/λ	1	1
4		$\frac{h}{2\pi}$	1	1
5		Protons: Z, Neutrons: A - Z	1	1
6		false	1	1
7		B= $\frac{_{0}n I}{2R}$	1	1
8		Eddy Current	1	1
9		Interference	1	1
10	(b)	increases	1	1
11	(d)	Manganin	1	1
12		negative	1	1
13		Scattering of light	1	1
14		The surface integral of magnetic flux over a closed surface is zero $\oint \vec{B}.\vec{ds} = 0$	2	2
15			2	2

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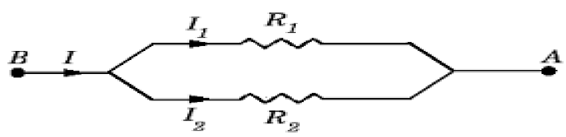
16	(a) (b)	NAND and NOR gates are called universal gates. All gates like OR,AND and NOT can be derived from NAND and NOR gate.	1 1	2
17		Two sources are said to be coherent, if they emit light waves of the same frequency, same wavelngth,same phase or at a constant phase difference.	2	2
18	(a) (b)	Circle Spiral		
19		(1) Used to detect fractures. (2) Used for cancer treatment. (3) X-Ray diffraction		
20	a) b)	$\vec{\tau} = \vec{p} \times \vec{E}$ Or τ = PE sinθ $\theta = 90$	1 1	2
21	a) b)	Ohm  $I = I_1 + I_2$ --------(1) But, $I_1 = \frac{V_1}{R_1}$ $I_2 = \frac{V_2}{R_2}$ --------(2) $I = \frac{V_1}{R_1} + \frac{V_2}{R_2}$ $I = \frac{V}{R}$ -------(3) $\frac{V}{R} = \frac{V_1}{R_1} + \frac{V_2}{R_2}$ -------(4) OR, $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$	1 2	3
22	a) b)	R=2f	1	

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		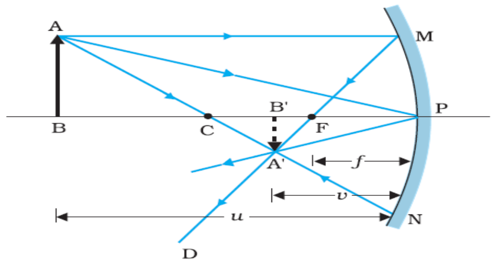 $\frac{B'F}{FP} = \frac{B'P}{BP}$ $B'P=v$, $BP=u$, $B'F=v-f$, $FP=f$ $\frac{v-f}{f} = \frac{v}{u}$ 1 Applying convention $\frac{-v- -f}{-f} = \frac{-v}{-u}$ $v/f -1=v/u$ Dividing by v $1/f-1/v=1/u$ $\frac{\ }{u}+\frac{1}{v}=\frac{1}{f}$	2	3
23	a) b)	The angle made by the earth's magnetic field at the place with the horizontal. $B_H=B\cos\Phi$ $B=0.2 \times 10^{-4}/\cos 60 =0.4 \times 10^{-4}$ $B_v=B \sin \Phi=0.4 \times 10^{-4} \sin 60=0.346\times10^{-4}$ T	1 2	3
24	a) b)	1. A surface on which is electric potential is constant at all points. 2.No work is required to move a charge from one point to another on the equipotential surface. Sphere	2 1	3
25	a)	1.The photocurrent is directly proportional to the intensity of incident radiation. 2. If the frequency of incident radiation is less than threshold frequency then the emission is not possible.	2	3

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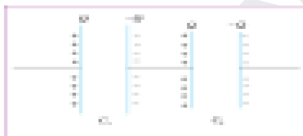
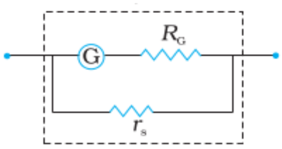
	b)	It is the voltage required to stop the most energetic electrons in the photo apparatus.	1	
26	a) b)	The difference in mass between total masses of constituent nucleons of a nucleus and stable nucleus mass is called ma defect. Mass defect=$(ZM_p + (A-Z)M_n) - M$ M=Mass of stable nucleus Nuclear fission	2 1	3
27	a) b)	The minimum energy required to remove the most loosely bound electron of an isolated neutral atom. 1. It can't explain the stability of an atom. 2. It didn't explain the arrangement of an electron inside the atom.	1 2	3
28	a) b)	 The total potential drop V across the combination is $V=V_1+V_2$ Let C be the effective Capacitance of the combination and charge Stored in it is Q, then potential across the combination is V=Q/C then equation for V become $Q/C=(Q_1/C_1)+(Q_2/C_2)$ Or $1/C=(1/C_1)+(1/C_2)$ Generally for series combination of 3 capacitors $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$ c=900μF, V=100V Then $E=(1/2)CV^2 = 0.5 \times 900 \times 10^{-6} \times 100^2 = 4.5J$	2 2	4
29	a) b)	Works on the basis of torque acting on a rectangular loop in a magnetic field. The torque on a coil of N turns is given by $\tau = NIAB \sin\theta$. Ammeter- By connecting small resistance (shunt resistance) parallel to the galvanometer  Ammeter	1 3	4

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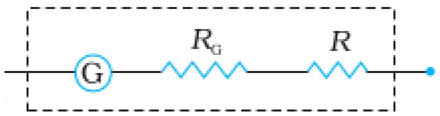
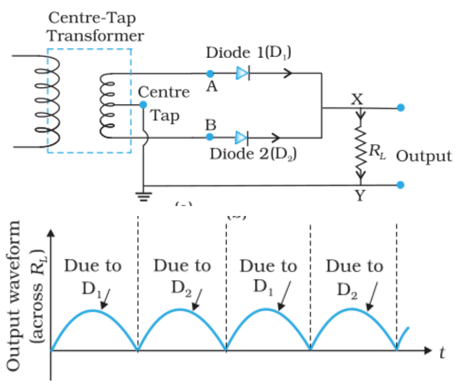
		Voltmeter- By connecting high resistance in series to the galvanometer  Voltmeter		
30	a) b)	Electromagnetic induction The work to be done against the back emf in an inductor is stored as magnetic potential energy. For the current I at an instant in a circuit, the rate of work done is $v = -e = \boxed{L\frac{di}{dt}}$ Rate of workdone $\boxed{\frac{dW}{dt}} = v\,i = \boxed{L\frac{di}{dt}}\ i$ $dW = Li\,di$ $W = L \boxed{\int_0^{I_0} i\,di = \frac{1}{2} L I_0^2}$	1 3	4
31	a) b)	The PN junction diode offers low resistance in forward bias and high resistance in reverse bias. So diode can be used in the rectifier.  During the positive half cycle of the input ac signal, the	1 3	4

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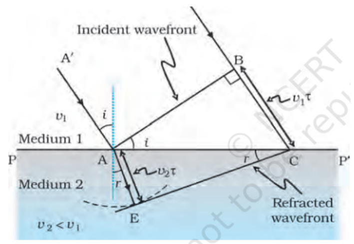
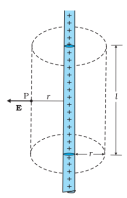
		diode D1 conducts and during the negative half cycle diode D2 conducts. During both cycle current through the resistor is remain same		
32	a) b)	Mutual induction $Ns=N_p(V_s/V_p)$ =4000x(230/2300)=400 turns	1 3	4
33	a) b)	 BC = v1 τ AE = v2T: $\frac{\sin i}{\sin r}$ =v1/v2 We have n2/n1 = v1/v2. Hence proved Diffraction	3 1	4
34	a) b) c)	Ratio of the Sine of angle of incidence to the sine of angle of refraction is a constant Or $\frac{\sin i}{\sin r}$ =n Derivation of Lens Maker's formula virtual	2 3 1	6
35	a) (b) c)	**Electric flux** **The total electric flux over a closed surface is** $1/\varepsilon_0$ **times the net charge enclosed by the surface.** $\oint E.ds = q/\varepsilon_0$  $\oint E.ds = q/\varepsilon_0$;$\oint E.ds = q/\varepsilon_0$; **q=**$\lambda l$; $\int E.ds = \lambda l/\varepsilon_0$; $surface\ area\ of\ the\ cylinder\ =\ 2\pi rl;\quad E = (1/2\pi\varepsilon_0)\frac{\lambda}{r}$	1 2 3	6

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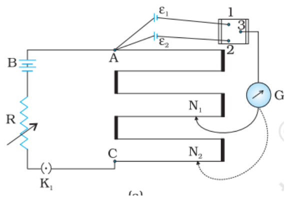
36	a)	E $\propto l$	1	6
	b)	 $E_1 \propto L_1$ $E_2 \propto L_2$ $E_1/E_2 = L_1/L_2$	3	
	c)	$E_1 = E_2 * (L_1/L_2)$; E_1 **= 1.25 *(70/35);** E_1 **= 2.5 V**	2	