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PHYSICS HSSC-II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Candidate Sign. _____

Invigilator Sign. _____

Answer Sheet No. _____

Signature should not cross this line

Version No.				
4	2	0	4	3

ROLL NUMBER						

Deleting/overwriting is not allowed. ***Do not use lead pencil.***

Fill the relevant bubble against each question according to curriculum:

	Question	A	B	C	D	A	B	C	D
1.	Velocity of a wind packet (mass= $2\times10^5 kg$), if a Coriolis Force (F_c) of $274N$ bends it at an angle of 25° would be:	$32.2 kmhr^{-1}$	$42.2 kmhr^{-1}$	$12.2 ms^{-1}$	$22.2 ms^{-1}$	○	○	○	○
2.	Which of the following electro-magnetic waves has the highest frequency?	Gamma rays	Ultraviolet	Microwaves	Infrared	○	○	○	○
3.	Two objects attract each other with a gravitational force 'F'. If mass of one object is doubled and distance between their centers remains same, then gravitational force is:	2F	4F	F/2	F	○	○	○	○
4.	The gravitational field strength at a point depends on:	Shape of the test body	Velocity of the body	Mass of the test body	Mass causing the field	○	○	○	○
5.	The SI unit of luminosity 'L' is:	Watt m^{-2}	Kelvin	Watt	Joule	○	○	○	○
6.	In SHM, the relationship between acceleration and displacement of a particle when $\omega = 10$ is:	$a=-100x$	$a=100x^2$	$a=10x$	$a=-10x^2$	○	○	○	○
7.	What is the frequency of the body when its time period is 2s?	0.5 Hz	0.2 Hz	1 Hz	2 Hz	○	○	○	○
8.	The wavelength of light can be accurately determined by using a:	Interferometer	Capacitor	Melde's apparatus	Diffraction grating	○	○	○	○
9.	Electric potential due to a point charge varies with distance as:	$1/r^2$	r^2	$1/r$	r	○	○	○	○
10.	The capacitance of a parallel plate capacitor increases when:	Area of plates increases	Using battery of low potential	Distance between plates increases	Area of plates decreases	○	○	○	○
11.	In a bridge rectifier, current flows through the load:	During both half cycles in the same direction	During both half cycles in alternating directions	Only during positive half cycle	Only during negative half cycle	○	○	○	○
12.	In a pure inductive AC circuit, the applied voltage leads the current by:	0	$\frac{\pi}{2}$	$\frac{3\pi}{2}$	π	○	○	○	○

III

	Question	A	B	C	D	A	B	C	D
13.	De–Broglie wavelength of a body having mass 0.5 kg moving with a speed of 36 km/hr is:	$1.3\times10^{-34}\,mm$	$1.3\times10^{-24}\,mm$	$1.3\times10^{-24}\,m$	$1.3\times10^{-34}\,m$	○	○	○	○
14.	Number of electrons emitted in photoelectric effect depends upon:	Energy of incident light	Wavelength of incident light	Intensity of Incident light	Frequency of incident light	○	○	○	○
15.	In nuclear fission, a chain reaction occurs due to the release of:	Photons	Neutrons	Protons	Electrons	○	○	○	○
16.	According to the inverse square law, radiant flux intensity is inversely proportional to:	Temperature	Luminosity	Distance	Square of distance	○	○	○	○
17.	Which layer of the atmosphere contains the ozone layer?	Mesosphere	Stratosphere	Troposphere	Thermosphere	○	○	○	○

$F=\frac{Gm_1m_2}{r^2}$ $T=\frac{1}{f}$ $F=\frac{L}{A}$ $c=\frac{\varepsilon_o A}{d}$ $\lambda=\frac{h}{p}$ $T=2\pi\sqrt{\frac{\ell}{g}}$

$a=-\omega^2x$ $p=mv$ $h=6.63\times10^{-34}\,Js^{-1}$ $R=R_e+h$ $g=9.8ms^{-2}$ $rV=kq$

$v=v_o\sin(\theta)$ $\theta=\omega t$ $\omega_{earth}=7.3\times10^{-5}\,rads^{-1}$ $F_c=2mv\omega_{earth}\sin\theta$ $E=hf$ $P=\frac{E}{C}$

$g=\frac{GM_e}{R^2}$ $V=\frac{W}{Q}$

ROLL NUMBER						

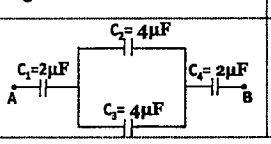
PHYSICS HSSC–II

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Time allowed: 2:35 Hours **Total Marks Sections B and C: 68**

SECTION – B (Marks 42)

Q. 2 Answer the following parts briefly. **(14x3=42)**

(i)	How will the orbital velocity of a satellite be affected when it is put into a lower orbit (closer to the Earth)? Explain mathematically.	1+2	OR	A body with mass 800g attached to a spring executes SHM. The restoring force is 60N when the displacement is 0.3m. a. Find out its angular frequency b. Also find the magnitude of acceleration when the displacement is 12cm.	1+1+1
(ii)	How is the pressure related to the density of the gas? Also give its mathematical expression.	2+1	OR	State the conditions necessary for observing interference fringes.	1x3
(iii)	How does resonance play an important role in tuning of radio station?	03	OR	Briefly explain the use of capacitors in any three household appliances.	1x3
(iv)	What is mutual inductance? Also write its SI unit and the factors upon which it depends.	1+2	OR	What will be the value of gravitational field strength 'g' at 35,700 km, where a satellite is orbiting the earth?	03
(v)	What is meant by breaking radiation? Also write the relation for minimum wavelength of x-rays.	2+1	OR	An AC voltage across a 0.5μF capacitor is $16\text{Sin}(2\times10^3 t)V$. Find its capacitive reactance.	03
(vi)	Explain the role of atmosphere in maintaining climate balance.	03	OR	What is meant by contrast in X-ray imaging?	03
(vii)	Briefly describe pair annihilation. Also justify the conservation of energy and momentum in this process.	1+2	OR	How does ocean play a main role in climate inertia?	03
(viii)	Briefly discuss two applications of ultrasound in medical technology.	03	OR	Why does electron microscope have higher resolution than optical microscope? (Compare both.)	1.5+1.5
(ix)	How is the variation of binding energy per nucleon an important factor in nuclear physics? (Discuss both high binding energy and low binding energy)	1.5+1.5	OR	An AC circuit consists of pure resistance of 20 Ω and is connected across AC supply of 220V, 50Hz. Calculate: a. Peak value of voltage. b. Peak value of current.	03
(x)	How does energy imbalance between equator and poles affect earth climate?	03	OR	How can Wien's displacement law be used to determine the temperature of a star? Also write its formula.	2+1
(xi)	Why the value of 'g' does not change significantly near the Earth's surface? (Show mathematically)	03	OR	Briefly explain the function of control rods and moderators in nuclear reactor.	1.5+1.5
(xii)	Calculate the average translational kinetic energy of a gas molecule at a temperature 47°C.	03	OR	What is meant by free oscillations? Also give its two examples.	1+2
(xiii)	How does increasing the number of slits per unit length affect the diffraction pattern? Make a sketch.	2+1	OR	Distinguish between peak value and root mean square (rms) values of alternating voltage.	1.5+1.5
(xiv)	How can one increase the fringe spacing in Young's double slit experiment? Also write its mathematical calculation.	2+1	OR	Deduce the equivalent capacitance between A and B for the given circuit. 	03

SECTION – C (Marks 26)

Note: Attempt the following questions.

Q.3	Briefly describe gravitational potential and derive the expression $\varphi = -\frac{GM}{r}$ at a distance r from the center of Earth. Make a sketch.	2+4+1	OR	Derive expressions for Kinetic and Potential energies of a mass attached to a spring executing SHM. Show that total energy of the spring system remains constant. Also make neat sketch.	2+2+2+1
Q.4	Explain the working of Young's double slit experiment. Make diagram. Also derive the expression for fringe spacing.	4+1+2	OR	a. Determine the electrical potential energy stored in a capacitor by using graph. b. Calculate the energy stored, in a capacitor having 5C of charge and potential different of 15V.	(3+1)+3
Q.5	Explain the working of a bridge rectifier using four diodes. Also draw the circuit diagram.	4+2	OR	What is photoelectric effect? Explain work function of metal and Einstein photo electric equation. What is the effect of frequency of radiation on K.E of photoelectrons?	1+3+2
Q.6	a. What is meant by luminosity of a star? Write the relation between luminosity, radius and temperature. b. What are the relative luminosities of the objects A and B if T_A=100K, T_B = 200K, R_A = 10m and R_B=5m	3+3	OR	a. Derive and show that the decay of nucleus is exponential with time. b. If half-life of strontium (Sr. 91) is 9.70 hours. Find its decay constant.	3+3

$v_o = \sqrt{\frac{GM_e}{R}}$ $\omega = \sqrt{\frac{k}{m}}$ $X_c = \frac{1}{\omega C}$ $V_{rms} = \frac{V_o}{\sqrt{2}}$ $g = G\frac{M_e}{R^2}$ $I_{rms} = \frac{I_o}{\sqrt{2}}$ $T = \frac{2}{3k}\left\langle \frac{1}{2}mv^2 \right\rangle$ $m = \frac{M}{N_A}$

$F = kx$ $\omega = 2\pi f$ $M_e = 6\times10^{24}kg$ $a = -\omega^2 x$ $R_e = 6.4\times10^6 m$ $N_A = 6.022\times10^{23}$ $A = \lambda N$ $M_{oxygen} = 32g$

$F = \frac{L}{A}$ $T_{\frac{1}{2}} = \frac{0.693}{\lambda}$ $\lambda = \frac{1}{N}\times\frac{\Delta N}{\Delta t}$ $v_{rms} = \sqrt{\frac{3P}{\rho}}$ $v_{rms} = \sqrt{\frac{3kT}{m}}$ $v_{rms} = \sqrt{\frac{3RT}{M}}$ $f = \frac{1}{T}$ $F = \frac{L}{4\pi d^2}$

$k = 1.38\times10^{-23}JK^{-1}$ $R = 8.314Jmol^{-1}K^{-1}$ $R = R_e + h$ $\sigma = 5.67\times10^{-8}Wm^{-2}K^{-4}$