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Part III — PHYSICS

(English Version)

Time Allowed: 3 Hours]

[Maximum Marks : 150

PART - I

N. B.: i) Answer all the questions.

- ii) Choose and write the correct answer.
- iii) Each question carries one mark.

 $30 \times 1 = 30$

1. Joule's law of heating is

a)
$$H = \frac{I^2}{R}t$$

b)
$$H = V^2 Rt$$

c)
$$H = IR^2 t$$

d)
$$H = VIt$$

2. Fuse wire is an alloy of

a) Lead and Tin

b) Tin and Copper

c) Lead and Copper

d) Lead and Iron.

3. Electromagnetic induction is not used in

a) transformer

b) room heater

c) AC generator

d) choke coil.

4. Lenz's law is in accordance with the law of

- a) conservation of charges
- b) conservation of flux
- c) conservation of momentum
- d) conservation of energy.

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5.	In	a transformer, eddy cur	rrent loss is minin	nised by using
	a)	laminated core made	of Mumetal	
	b)	laminated core made	of stelloy	
	c)	shell type core		
	d)	thick copper wires.		EL CONTRACTOR OF THE STATE OF T
6.	Th	e ratio of the radii of the	e first three Bohr	orbits is
	a)	$1: \frac{1}{2}: \frac{1}{3}$	b)	1:2:3
	c)	1:4:9	d)	1 (8) 27.
7.	The	e first excitation potentia	al energy or the m	nimum energy required to excite th
	atom from ground state of hydrogen atom is			
	a)	13.6 eV	b)	10·2 eV
	c)	3.4 eV	(d)	1.89 eV.
8.	In l	hydrogen atom, which o	of the following tra	unsitions produces a spectral line o
		ximum wavelength?		
	a)	$2 \rightarrow 1$	b)	$4 \rightarrow 1$
	c)	6 → 5	d)	5 → 2.
9.	If th	e minimum wavelength	of X-rays produce	d from a Coolidge tube is 0.062 nm
	ther	the potential difference	e between the cath	node and target material is
	a)	2000 V	b)	20,000 V
	c)	$2 \times 10^5 \text{ V}$	d)	$6.2 \times 10^{3} \text{ V}.$
10.	The	work function of a phot	o-electric materia	is 3.3 eV. The threshold frequency
		be equal to	to we see at	www.management.
	a)	$8 \times 10^{14} \text{ Hz}$	b)	$8 \times 10^{10} \text{ Hz}$

d) 4×10^{14} Hz.

c) 5×10^{20} Hz

11.	1. The forbidden energy gap of silicon is of the order of				
	a)	0·1 eV	b)	0.3 eV	
	c)	0.7 eV	d)	1.1 eV.	
12.	An o	scillator is		.ci both fator laid torque	
	a)	an amplifier with feedback		vina estab - 18	
	b)	a converter of a.c. to d.c. energy		19. A capacitin of capacitance 6	
	c)	nothing but an amplifier		al rollande capacitor is	
	d)	an amplifier without feedback.	+	\mathcal{O}	
13.	Of th	ne following, the donor atoms are			
	a)	silicon and germanium	b)	aluminium and gallium	
	c)	bismuth and arsenic	d)	boron and indium.	
14.	The	audio frequency range is		C manage comment to	
	a)	20 Hz to 200000 Hz	b)	20 Hz to 2000 Hz	
	c)	20 Hz to 2000000 Hz	d)	20 Hz to 20000 Hz.	
15.	Prin	ted documents to be transmitted by	fax	are converted into electrical signals	
	by t	he process of			
*	a)	reflection	b)	scanning	
	c)	modulation	d)	light variation.	
16.	The	unit of permittivity is			
	a)	$C^{2}N^{-1}m^{-2}$		Nm ² C ⁻²	
	c)	Hm-1	d)	NC ⁻² m ⁻² .	
17.	The	work done in moving 500 μC cha	rge b	etween two points on equipoteral	
		face is	*		
	a)	zero	b)	finite positive	
	c)	finite negative	d)	infinite.	

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18.	. An electric dipole placed at an angle θ in a non-uniform electric field experiences			
	a)	neither a force nor a torque		10 10 10
	b)	torque only		v3 T-0 63 /
	c)	both force and torque		21. An oscillator is
	d) -	force only.		at a consider with freelistick
19.	A c	apacitor of capacitance 6 µF is co	nnec	ted to a 100 V battery. The energy
	stor	red in the capacitor is		really was an and sould form - In
	a)	30 J	b).	3 J
	c)	0.03 J	d)	0.06 J.
20.	In th	he case of insulators, as the tempera	ature	decreases, the resistivity
	a)	decreases	b)	increases
	c)	remains constant	d)	becomes zero.
21.	A po	ower of 11,000 W is transmitted at 2	20 V	. The current through line wires is
	a)	50 A	b)	5 A 6 0000000 61 4H 00
	c)	500 A	d)	0-5 A.
22.	Whi	ch of the following gives rise to conti	nuou	s emission spectrum ?
	a)	Electric filament lamp	b)	Sodium vapour lamp
	cj	Gases in the discharge tube	d)	Calcium salt in bunsen flame.
23.	Whe	n a drop of water is introduced be	tween	n the glass plate and plano-convex
		in Newton's rings system, the ring s		
	a)	contracts		
	ь,	expands		NI work all NI
	c) -	remains same		
	d)	first expands, then contracts.		

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24.	A light of wavelength 6000 Å is incident 2500 lines. Then the maximum order is		nally on a grating 0.005 m wide with
	a) = 3	b)	2 - 1 The constant of the later
	c) 1	d)	4.
25.	The transverse nature of light waves is	demo	onstrated only by the phenomenon of
	a) interference	b)	diffraction

- 26. The particle which has zero mass but has energy, is
 - electron

c)

polarisation

photon b)

d)

c) proton

neutron. d)

reflection.

- 27. The nuclei $_{13}$ Al 27 and $_{14}$ Si 28 are example of
 - isotopes

isobars b)

isotones

- 28. The mean life (τ) and half-life ($T_{1/2}$) of a radioactive element are related as

a)
$$\tau = 2 T_{1/2}$$

b)
$$\tau = \frac{T_{1/2}}{0.6931}$$

c)
$$\tau = 0.6931 T_{1/2}$$

$$d) \tau = \frac{T_{1/2}}{2}$$

- after emitting three α -particles and four 29. A radioactive element $_{Z}X^{A}$ β -particles is converted into an element Y represented as

Z+2 Y^{A-12}

- d) $z_{-10} Y^{A-12}$.
- 30. Which of the following is used to detect the presence of blocks in blood vessels?
 - a)

15 P 32 b)

26 Fe ⁵⁹ c)

11 Na 24. d).

PART - II

N. B.: Answer any fifteen questions.

 $15 \times 3 = 45$

- 31. Three capacitors each of capacitance 9 pF are connected in series. What is the total capacitance of the combination?
- 32. What is electrostatic shielding?
- 33. The resistance of a nichrome wire at 0°C is 10 Ω . If its temperature of coefficient of resistance is 0.004/°C, find its resistance at boiling point of water.
- 34. Define Mobility. Write its unit.
- 35. State Kirchhoff's (i) current law, (ii) voltage law.
- 36. Define ampere in terms of force between two long parallel current carrying conductors.
- 37. An aircraft having a wingspan of 20.48 m files due north at a speed of 40 ms $^{-1}$. If the vertical component of earth's magnetic field at the place is 2×10^{-5} T, calculate the e.m.f. induced between the ends of the wings.
- 38. What is electromagnetic induction?
- 39. Two slits 0.3 mm apart are illuminated by light of wavelength 4500 Å. The screen is placed at 1 m distance from the slits. Find the separation between the second bright fringe on both sides of the central maximum.
- 40. Define specific rotation.
- 41. State Moseley's law. Write its equation.
- 42. Write any three medical applications of laser.
- 43. What are inertial and non-inertial frames?
- 44. Define curie.
- 45. Write any three properties of neutron.
- Draw the circuit configuration of NPN transistor in common collector (C.C.) mode.
- 47. What is Zener breakdown?
- 48. A transistor is connected in CE configuration. The voltage drop across the load resistance ($R_{\rm C}$) 3 k Ω is 6 V. Find the base current. The current gain α of the transistor is 0.97.
- 49. State de Morgan's theorems.
- 50. What is meant by skip distance?

PART - III

- N. B.: i) Answer Question No. 60 compulsorily.
 - ii) Answer any six of the remaining 11 questions,
 - iii) Draw diagrams wherever necessary.

 $7 \times 5 = 35$

- 51. Write the properties of electric lines of forces.
- 52. In Wheatstone bridge obtain the condition for bridge balance.
- 53. State Faraday's second law of electrolysis. How is it verified experimentally?
- 54. Explain the conversion of a galvanometer into an ammeter.
- 55. Find the phase relation between current and voltage in an a.c. circuit containing a pure inductor. (Graph is not necessary)
- 56. A parallel beam of monochromatic light is allowed to incident normally on a plane transmission grating having 5000 lines per cm. A second order spectral line is found to be diffracted at an angle 30°. Calculate the wavelength of the light.
- 57. An α -particle is projected with an energy of 4 MeV directly towards a gold nucleus. Calculate the distance of its closest approach.

Given: Atomic number of gold = 79

Atomic number of α -particle = 2.

- 58. Write any 5 applications of photoelectric cells.
- 59. Explain Lorentz-FitzGerald contraction with an example.
- 60. Calculate the time required for 60% of a sample of radon to undergo decay. (Given $T_{1/2}$ of radon = 3.8 days)

OR

Show that the mass of radium $_{88}$ Ra 226 with an activity of 1 curie is almost a gram. (Given $T_{1/2}$ = 1600 years)

(1 curie = 3.7×10^{10} disintegrations per second).

- 61. Draw the frequency response curve of single stage CE amplifier and discuss the results.
- 62. What is an optical fibre? Mention the advantages of fibre optical communication system.

PART - IV

- N. B.: i) Answer any four questions in detail.
 - ii) Draw diagrams wherever necessary.

 $4 \times 10 = 40$

- 63. Derive an expression for electric potential at a point due to an electric dipole.

 Discuss the special cases.
- 64. Deduce the relation for the Magnetic Induction at a point along the axis of a circular coil carrying current.
- 65. Explain in detail the principle, construction and working of a single phase a.c. generator.
- 66. What is Raman effect? Explain Raman spectrum with diagram.
- 67. Obtain the expression for the radius of n th orbit of an electron based on Bohr's theory.
- 68. What are cosmic rays? Explain the latitude effect of cosmic rays.
- 69. Draw the circuit diagram of Colpitts oscillator and explain its working.
- 70. Explain the analysis of amplitude modulated wave. Draw the plot of frequency spectrum.