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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)
- 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.

Turn over

A.C.	140		2	
5.	In	a transformer, eddy cur	rent loss is minin	nised by using
	a)	laminated core made	of Mumetal	
	b)	laminated core made	of stelloy	
	c)	shell type core		H dia 4
	d)	thick copper wires.		(G)
6.	I Th	e ratio of the radii of the	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.	Th	e first excitation potentia	al energy or the m	inimum energy required to excite th
	ato	om from ground state of l	hydrogen atom is	the their seconds. If
	a)	13.6 eV	b)	10-2 eV
	c)	3.4 eV	d)	1.89 eV.
8.		· ·	f the following tra	ansitions produces a spectral line of
	ma	ximum wavelength?		
	a)	$2 \rightarrow 1$	b)	4 → 1
	c)	6 → 5	d)	$5 \rightarrow 2$.
9.				ed from a Coolidge tube is 0.062 nm
	the	n the potential difference	between the cath	node and target material is
	a)	2000 V	b)	20,000 V
	c)	$2 \times 10^5 \text{ V}$	d)	$6.2 \times 10^{3} \text{ V}.$
io.	The	work function of a phot	o-electric material	l is 3.3 eV. The threshold frequency
		be equal to		Lenc's law is in accordance wi
	a)	$8 \times 10^{14} \text{ Hz}$	b)	$8 \times 10^{10} \text{ Hz}$
	c)	$5 \times 10^{20} \text{ Hz}$	d)	$4 \times 10^{14} \text{ Hz}.$

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		sepror bird solol idea (i).		
	a)	an amplifier with feedback		direction only		
	b)	a converter of a.c. to d.c. energy				
	c)	nothing but an amplifier		stored in the capacitor is		
	d)	an amplifier without feedback.	*			
13.	Of th	ne following, the donor atoms are		6 :80:0		
	a)	silicon and germanium	b) -	aluminium and gallium		
	c)	bismuth and arsenic	d)	boron and indium.		
14.	The	audio frequency range is		ei - remoine constant		
	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.		ted documents to be transmitted by he process of	fax	are converted into electrical signals		
	a)	reflection	b)	scanning		
	c)	modulation	d)	light variation.		
16.	The	unit of permittivity is				
	a)	C ² N ⁻¹ m ⁻²	b)	Nm ² C ⁻²		
	c)	Hm - 1	d)	NC ⁻² m ⁻² .		
17.		e work done in moving 500 μC cha	rge b	between two points on equipotersal		
	a)	zero	b)	finite positive		
	c)	finite negative	d)	infinite.		

A

18.	. An electric dipole placed at an angle θ in a non-uniform electric field experiences				
	a)	neither a force nor a torque	•	10 to 10	
	b)	torque only		vs r.o 6 '	
	c)	both force and torque		21 Ap. oscillator is	
	d) -	force only.		sj. an ampiliter with freelistick	
19.		apacitor of capacitance 6 µF is co	nnec	ted to a 100 V battery. The energy	
	a)	30 J	b).	3 J months religion on the	
	c)	0.03 J	d)	0.06 J	
20.	In t	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	220 V	. The current through line wires is	
	a)	50 A	b)	5 A (6000000 61 4H OC)	
	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	
	c)	Gases in the discharge tube	d)	Calcium salt in bunsen flame.	
23.				n the glass plate and plano-convex	
	lens	in Newton's rings system, the ring s	syster	m	
N	a)	contracts			
	b,	expands		Victoria de monte de la companya (1)	
	c) -	remains same			
	d)	first expands, then contracts.			

	5	1029
24. A light of wavelength 6000 Å is in	cident norma	lly on a grating 0.005 m wide with
2500 lines. Then the maximum of		
a) - 3	b)	2 Company of the Comp
	d)	4.
c) 1		atrated only by the phenomenon of
25. The transverse nature of light wa	ives is demon	Strated only by the particular to the strategy of the strategy
a) interference	b)	diffraction
c) polarisation	d)	reflection.
26. The particle which has zero mas	s but has ene	ergy, is
a) electron	b)	photon
c) proton	d)	neutron.
27. The nuclei 13 Al 27 and 14 Si 28	are example o	of
a) isotopes	b)	isobars
c) isotones	d)	isomers.
28. The mean life (τ) and half-life	$(T_{1/2})$ of a ra	adioactive element are related as
a) $\tau = 2 T_{1/2}$		$\tau = \frac{T_{1/2}}{0.6931}$
c) $\tau = 0.6931 T_{1/2}$	d)	$\tau = \frac{T_{1/2}}{2}.$
29. A radioactive element $_{Z}X^{A}$	after emi	tting three α-particles and four
β-particles is converted into an	element Y re	presented as
a) $z - 6 Y^{A-12}$	b)	$z+2$ Y^{A-12}
c) $Z-2$ Y^{A-12}	d)	$z_{-10}Y^{A-12}$.
20 Which of the following is used	to detect the	presence of blocks in blood vessels?
_ 01	b)	15 P 32
		₁₁ Na ²⁴ .
c) ₂₆ Fe ⁵⁹		[Turn over
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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.
- Define ampere in terms of force between two long parallel current carrying conductors.
- 37. An aircraft having a wingspan of 20.48 m flies 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.)
- 47. What is Zener breakdown?
- 48. A transistor is connected in CE configuration. The voltage drop across the load resistance (R_{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).

- 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.