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Part III — PHYSICS

(New Syllabus)

(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. The unit of reduction factor of tangent galvanometer is
 - a) no unit

b) tesla

c) ampere

- d) ampere / degree.
- 2. A galvanometer is converted into a voltmeter by connecting a
 - a) low resistance in series
- b) high resistance in parallel
- c) high resistance in series
- d) low resistance in parallel.
- 3. Electromagnetic induction is not used in
 - a) transformer

b) room heater

c) A.C. generator

d) choke coil.

| Turn over

4.	The angle between the area vector A and the plane of the area A is				
	a)	π	b)	2π	
	c)	$\frac{\pi}{2}$	d)	zero.	
5.	If t	he flux associated with a coil varie	s at	the rate of 1 Wb/minute then the	
4	ind	uced e.m.f. is			
	a)	1 V	b)	1 0 V	
	c)	60 V	d)	0.60 V.	
6.	The	chromium ions doped in the ruby ro	od		
	a)	absorbs red light	b)	absorbs blue light	
	c)	absorbs green light	d)	emits green light.	
7.	The	wavelength of D_1 and D_2 lines emit	ted b	y sodium vapour lamp is	
	a)	589-6 nm, 589 nm	b)	589 nm, 589·6 nm	
	c)	589·3 nm, 589 nm	d)	589 nm, 589·3 nm.	
8.		ne minimum wavelength of X -rays prating potential is	roduc	ed in a Coolidge tube is 0.62 Å, the	
	a)	20 kV	b)	0.2 kV	
	c)	2 kV	d)	10 kV.	
9.	9. Wave number is defined as the number of waves				
	a)	produced in one second	b)	in a distance of 1 metre	
	c)	in a distance of 3×10^{8} metre	d)	in a distance of λ metre.	
10.	The	value of stopping potential when	the	frequency of light is equal to the	
	thre	eshold frequency is			
	a)	maximum	b)	zero	
	c)	minimum	d)	infinity.	
В					

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		3	,	
11.	The	forbidden energy gap for germaniur	n is c	of the order of
	al	1·1 eV	b)	0.7 eV
	c)	0.3 eV	d)	10 eV.
12.	The	Boolean expression \overline{ABC} can be	simpl	ified as
	a)	$AB + \overline{C}$	b)	\overline{A} . \overline{B} . \overline{C}
	c)	AB + BC + CA	d)	$\overline{A} + \overline{B} + \overline{C}$.
13.	Con	dition for oscillator is		
	a)	$A\beta = 0$	b)	$A = \frac{1}{\beta}$
	c)	$A\beta = \infty$	d)	$A + \beta = 0.$
14.	High	h frequency waves follow		
	a)	the ground wave propagation		100.
	b)	the line of sight direction	4	
	c)	ionospheric propagation		0.
	d)	the curvature of the earth.		•
15.	In to	elevision, blanking pulse is applied to	•	
	a)	horizontal plates	b)	vertical plates
	c)	control grid	d)	filament.
16.	The	unit of electric flux is		
	a)	Nm ² C ⁻¹	b)	Nm ⁻² C ⁻¹
	-1	V 20	11	N -20

a) only a net force

- b) neither a net force nor a torque
- c) both a net force and a torque
- d) only a torque.

18. The work done in moving 4 μC charge from one point to another in an electric

	field is 0.012 J. The potential difference between them is					
	a)	3000 V	b)	6000 V		
	c)	30 V	d)	$48 \times 10^3 \text{ V}.$		
19.	The	electric field outside the two opposi	tely c	harged plane sheets each of charge		
	den	sity σ is				
	a)	$\frac{\sigma}{2 \in 0}$	b)	$\frac{-\sigma}{2 \in 0}$		
	c)	$\frac{\sigma}{\in 0}$	d)	zero.		
20.	Res	istance of a metal wire of length	l0 cn	n is 2Ω . If the wire is stretched		
	unif	formly to 50 cm, the resistance is				
	a)	25 Ω	b) .	10 Ω		
	c)	5 Ω	d)	50 Ω.		
21.	The	average power consumed over one of	ycle i	n an a.c. circuit is		
	a)	E _{rms} I _{rms}	b)	E _{rms} I _{rms} cos φ		
	c)	$E_{rms}I_{rms}\sin\phi$	d)	$E_0 I_0 \cos \phi$.		
22.	The	existence of electromagnetic waves	was c	onfirmed experimentally by		
	a)	Hertz	b)	Maxwell		
	c)	Huygens	d)	Planck.		
23.	3. When a drop of water is introduced between the glass plate and plano-convex					
	lens	s in Newton's rings system, the rings	syste	em		
	a)	contracts	b)	expands		
	c)	remains same	d)	first expands, then contracts.		
24.	Who	en a ray of light is incident on a glas	s sur	face at polarising angle of 57.5°, the		
	ang	le between the incident ray and the	reflec	ted ray is		
	a)	57·5°	b)	32·5°		
	c)	115°	d)	90°.		
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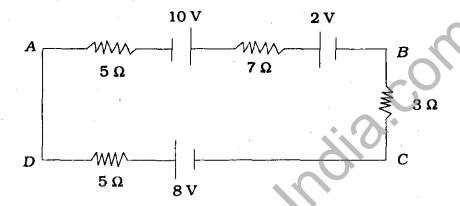
25.	Unp	Unpolarised light passes through a tourmaline crystal. The emergent light is			
	ana	alysed by an analyser. When the analyser is rotated through 90°, the intensity			
	of light				
	a)	remains uniformly bright			
•	b)	remains uniformly dark			
	c)	varies between maximum and mini	mum		
	d)	varies between maximum and zero	•		
26.	If th	he radius of third Bohr orbit in h	ydrog	gen atom is r, then the de Broglie	
	wav	relength of electron in this orbit is			
	a)	<u>r</u> 3	b)	3r	
	c)	$\frac{2\pi r}{3}$	d)	3 ($2\pi r$).	
27.	The	nuclear force is due to the continuo	nis ei	change of particles called	
	a) 、	leptons	b)	mesons	
	c)	hyperons	d)	photons.	
28.	In t	he following nuclear reaction			
		$_{7}N^{14} + _{0}n^{1} \rightarrow X + _{1}H^{1}$			
	the	element X is			
	a)	6 N 14	b)	6 C 14	
	c)	6 O 14	d)	₇ C ¹³ .	
29.	The	time taken by the radioactive element	nt to	reduce to $\frac{1}{e}$ times is	
	a)	half-life	b)	mean life	
	c)	half-life 2	d)	twice the mean life.	
30.	Whi	ich of the following particles is a lep	ton ?		
	a)	Electron	p)	Proton	
	c)	Neutron	d)	π-Meson.	
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PART - II

N. B.: Answer any fifteen questions.

 $15 \times 3 = 45$

- 31. Define 'Coulomb' on the basis of Coulomb's law.
- 32. Why is it safer to be inside a car than standing under a tree during lightning?
- 33. State Ohm's law.
- 34. In the following circuit, calculate the current through the circuit. Mention its direction.



- 35. State Faraday's laws of electrolysis.
- 36. Mention any two differences between Peltier effect and Joule's heating effect.
- 37. Calculate the mutual inductance between two coils when a current of 4 A changing to 8 A in 0.5 s in one coil, induces an e.m.f. of 50 mV in the other coil.
- 38. Mention the methods of producing induced e.m.f.
- 39. What are emission and absorption spectra?
- 40. A 300 mm long tube containing 60 c.c. of sugar solution produces a rotation of 9° when placed in a polarimeter. If the specific rotation is 60°, calculate the quantity of sugar contained in the solution.
- 41. Write the conditions to achieve laser action.
- 42. An X-ray diffraction of a crystal gave the first line at a glancing angle of 6° 27'. If the wavelength of X-ray is 0.58 Å, find the distance between the two cleavage planes.
- 43. What are the limitations of electron microscope?
- 44. What is α -decay? Give an example.
- 45. What is pair production and annihilation of matter?

- 46. What is an intrinsic semiconductor? Give two examples.
- 47. The gain of an amplifier without feedback is 100 and gain with positive feedback is 200. Calculate the feedback fraction.
- 48. Draw the circuit diagram for NPN transistor in Common Emitter (CE) mode.
- 49. Mention any three advantages of Integrated Circuit (IC).
- 50. Define modulation factor in Amplitude Modulation.

PART - III

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

 $7 \times 5 = 35$

- 51. A parallel plate capacitor has plates of area 200 cm² and separation between the plates is 1 mm. Calculate (i) the potential difference between the plates if 1 nC charge is given to the capacitor. (ii) With the same charge (1 nC) if the plate separation is increased to 2 mm, what is the new potential difference and (iii) the electric field between the plates?
- 52. Define mobility. Establish a relation between drift velocity and current.
- 53. Obtain the condition for bridge balance in Wheatstone bridge.
- 54. A circular coil of radius 20 cm has 100 turns of wire and it carries a current of 5 A. Find the magnetic induction at a point along its axis at a distance of 20 cm from the centre of the coil.
- 55. Obtain the phase relation between current and voltage in an a.c. circuit with an inductor only (graph not necessary).
- 56. Write a note on pile of plates.
- 57. Explain the spectral series of hydrogen atom without diagram.
- 58. Obtain Einstein's photoelectric equation.
- 59. Explain FitzGerald-Lorentz contraction with an example.
- 60. A piece of bone from an archaeological site is found to give a count rate of 15 counts per minute. A similar sample of fresh bone gives a count rate of 19 counts per minute. Calculate the age of the specimen.

(Given $T_{1/2} = 5570 \text{ Years}$).

Calculate the energy released when 1 kg of $_{92}$ U 235 undergoes nuclear fission. Assume, energy per fission is 200 MeV.

Avogadro number = 6.023×10^{23} . Express your answer in kilowatt hour also.

- 61. State and prove de Morgan's theorems.
- 62. What are the advantages and disadvantages of digital communication?

PART - IV

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

 $4 \times 10 = 40$

- 63. What is an electric dipole? Derive an expression for the electric field due to an electric dipole at a point on its axial line.
- 64. Applying Biot-Savart law, obtain an expression for the magnetic induction at a point due to infinitely long straight conductor carrying current.
- 65. Explain the principle, construction and theory of a transformer. (Diagram not necessary). Define its efficiency. Mention the energy losses.
- 66. On the basis of wave theory, explain total internal reflection.
- 67. State Bohr's postulates. Obtain an expression for the radius of n th orbit of hydrogen atom.
- 68. What is a nuclear reactor? Explain the functions of (i) moderator, (ii) control rods and (iii) neutron reflector. Mention the uses of nuclear reactor. (Diagram not necessary).
- 69. What is rectification? Explain the working of a bridge rectifier with necessary waveforms.
- 70. With the help of block diagram, explain the function of a monochrome TV receiver.