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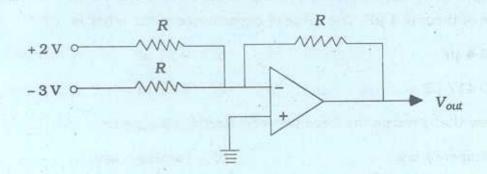
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Part III — PHYSICS

			(Englis	n versi	on)	
Tin	ne Al	lowed: 3	Hours]		[Maximu	ım Marks : 150
			PA	RT - I		
	. 1	V. B. : 1)	Answer all the questi	ons.		
		ti)	Choose and write the	correct	answer.	and diest
		iii)	Each question carries	s one ma	ark.	30 × 1 = 30
1.	Wh	ich of the	following principles is u	sed in a	thermopile?	
	a)	Thomson	n effect	b)	Peltier effect	
	c)	Seebeck	effect	d)	Joule's effect.	
2.	An	ideal voltm	neter has			
	a)	zero resis	stance	3		
	b)	finite res	istance between zero a	nd G	Agran of	
	c)	resistanc	e greater than G but les	ss than	infinity	
	d)	infinite re	esistance.			
3.	Tra	nsformer v	works on		Samuel and	
	a)	AC only				
	b)	DC only				grant of
	c)	both AC	and DC			east list
23	d)	AC more	effectively than DC.			

4.	The reactance offered by 300 mH inductor to an AC supply of frequency 50 Hz				
	is				
	a) 1046 Ω	b)	94-2 Ω		
	c) 9420 Ω	d)	104.6 Ω .		
5.	The r.m.s. value of an a.c. voltage wi	th a peal	k value of 311 V is		
	a) 110 V	b)	220 V		
	c) 50 V	d)	70·7 V.		
6.	The unit of Rydberg constant is				
	a) m	b)	no unit		
	c) m ⁻²	d)	m^{-1} .		
7.	For the first order X-ray diffraction,	the wav	elength of the X-ray is equal to the		
	lattice spacing at a glancing angle of				
	a) 15°	b)	60°		
	c) .45°	d)	30°.		
8.	According to Bohr's postulates, whi values?	ch of the	e following quantities takes discrete		
	a) Kinetic energy	b)	Potential energy		
	c) Angular momentum	d)	Momentum.		
9.	A Coolidge tube operates at 18600 emitted from it is	V. The	maximum frequency of X-radiation		
	a) $4.5 \times 10^{18} \text{ Hz}$	b)	$45 \times 10^{18} \text{ Hz}$		
	c) 4.05 × 10 ¹⁸ Hz	d)	45.5×10^{18} Hz.		
10.	When a material particle of rest ma	ss 'm o	attains the velocity of light, its mass		
	becomes				
	a) 0 .	b)	2 m _o		
	c) 4 m	d)	00,		

11. The output voltage of the operational amplifier (Op-Amp) given below is



a) - 1 V

b) + 1 V

c) + 5 V

- d) 5 V.
- 12. Avalanche breakdown is primarily dependent on the phenomenon of
 - a) collision

b) ionisation

c) doping

- d) recombination.
- 13. In a junction transistor the emitter region is heavily doped since emitter has to supply to the base
 - a) minority carriers

b) majority carriers

c) acceptor ions

- d) donor ions.
- 14. A logic gate which has an output '1', when the inputs are complement to each other is
 - a) AND

b) NAND

c) NOR

- d) EXOR.
- 15. The first man-made satellite is
 - a) Aryabhatta

b) Sputnik

c) Venera

- d) Rohini.
- 16. The number of electric lines of force originating from a charge of 1 microcoulomb is
 - a) 1.129 × 10⁵

b) 1.6×10^{-19}

c) 6.25 × 10 18

d) 8.85×10^{-12} .

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17.				in series is 1.5 μF. The capacitance
	of o	ne of them is 4 µF. The value of ca	apacitai	nce of the other is
	a)	2·4 μF	b)	0·24 μF
	c)	0-417 μF	d)	4·17 μF.
18.	The	law that governs the force between	n elect	ric charges is
	a)	Ampere's law	b)	Faraday's law
	c)	Coulomb's law	d)	Ohm's law.
19.		ipole is placed in a uniform electreriences	ic field	with its axis parallel to the field. I
8 8	a)	only a net force		
	b)	only a torque		
	c)	both a net force and torque		
	d)	neither a net force nor a torque.		
20.	The	material through which electric c	harge c	an flow easily is
	a)	quartz	b)	mica
	c)	germanium	d)	copper.
21.	The	e core used in audio frequency cho	kes is	
	a)	iron	b)	carbon
	c)	lead	d)	steel.
22. The phenomenon of light used in the formation of Newton's rings is				ion of Newton's rings is
	a)	diffraction	b)	interference
	c)	refraction	d)	polarisation.
23.	An	example for uniaxial crystal is		
	a)	tourmaline	b)	mica
	c)	topaz	d)	selenite.

24.		Raman effect, the spectral line w	vith le	ower frequency than the incident			
	a)	Fraunhofer line	b)	Rayleigh line			
	c)	Stokes' line	d)	anti-Stokes' line.			
25.	The	optical rotation does not depend on					
	a)	concentration of the solution					
	b)	frequency of the light used					
	c)	the temperature of the solution					
28	d)	intensity of the light used.					
26.	A pl	A photon of frequency γ is incident on a metal surface of threshold frequency γ_o .					
The kinetic energy of the emitted photoelectron is				on is			
	a)	$h(\gamma - \gamma_o)$	b)	hγ			
	c) .	hy,	d)	$h(\gamma + \gamma_o)$.			
27. The nuclei 13 Al 27 and 14 Si 28 are examples of				s of			
	a)	isotopes	b)	isobars			
	c)	isotones	d)	isomers.			
28.	The	fuel used in Kamini reactor is		wednesd with			
	a)	92 U ²³⁸	b)	92 Ù ²³³			
	c)	₉₂ Pu ²³⁹ .	d)	low enriched uranium.			
29. The binding energy of ₂₆ Fe ⁵⁶ nucleus is							
	a)	8-8 MeV	b)	88 MeV			
	c)	493 MeV	d)	41.3 MeV.			
30.			ctive e	element with disintegration constant			
		693 per day is	l (und	Pan to assistant to religiously			
	a)	10 days	b)	14 days			
	c)	140 days	d)	1.4 days.			

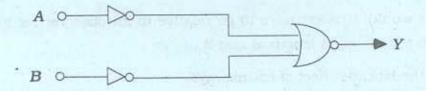
PART - II

N. B.: Answer any fifteen questions.

 $15 \times 3 = 45$

- 31. Write the applications of capacitor.
- 32. What do you mean by "Additive nature of charge" ? Give an example.
- 33. State Ohm's law.
- 34. The resistance of a Nichrome wire at 0°C is 10 Ω . If its temperature co-efficient of resistance is 0.004/°C, find its resistance at boiling point of water.
- 35. Mention any three applications of super-conductors.
- 36. Calculate the resistance of the filament of a 100 W, 220 V electric bulb.
- 37. Why can a d.c. ammeter not read a.c.?
- 38. State Faraday's laws of electromagnetic induction.
- 39. Distinguish between interference and diffraction fringes.
- 40. A light of wavelength 5890 Å falls normally on a thin air film. 6 dark fringes are seen between two points. Calculate the thickness of the air film.
- 41. What is hologram?
- 42. Write down the two important facts of the Laue experiment on X-ray diffraction.
- 43. State the postulates of special theory of relativity.
- 44. The half-life of 84 Po 218 is 3 minutes. What percentage of the sample has decayed in 15 minutes?
- 45. What is the use of a control rod in the reactor? Mention any two control rods.
- 46. What are the advantages of negative feedback?
- 47. Give the Barkhausen criteria for oscillations.

- 48. Give the important parameters of an operational amplifier.
- 49. The outputs of two NOT gates are NORed, as shown in the figure. What is the logic operation performed?



50. What is the necessity of modulation?

PART - III

- N. B.: i) Answer Question No. 56 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 force.
- 52. Explain the principle of a potentiometer.
- 53. Explain the action of lead-acid accumulator.
- 54. A long straight wire carrying current produces a magnetic induction of 4×10^{-6} T at a point 15 cm from the wire. Calculate the current through the wire.
- 55. Explain how an e.m.f. can be induced by changing the area enclosed by the coil.
- 56. A soap film of refractive index 1.34, is illuminated by white light incident at an angle 30°. The reflected light is examined by a spectroscope in which dark band corresponding to the wavelength 5893 Å is found. Calculate the smallest thickness of the film.

OR

In Young's experiment a light of frequency 6×10^{14} Hz is used. Distance between the centres of adjacent fringes is 0.75 mm. Calculate the distance between the slits, if the screen is 1.5 m away.

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57. Prove that the energy of an electron for hydrogen atom in the nth orbit is

$$E_n = \frac{-me^4}{8 \, \epsilon_0^2 \, n^2 \, h^2}$$

- 58. Explain the wave mechanical concept of atom.
- 59. How fast would a rocket have to go relative to an observer for its length to be corrected to 99% of its length at rest?
- 60. Explain the latitude effect of cosmic rays.
- 61. Explain the function of a transistor as a switch.
- 62. Draw the block diagram of AM radio transmitter.

PART - IV

N. B.: 1) Answer any four questions in detail.

ii) Draw diagrams wherever necessary.

 $4 \times 10 = 40$

- Deduce an expression each for the equivalent capacitance of capacitors connected in (i) series and (ii) parallel.
- Deduce the relation for the magnetic induction at a point along the axis of a circular coil carrying current.
- 65. Describe the principle, construction and working of a single phase A.C. generator.
- 66. Explain the Raman scattering of light with the help of energy level diagram.
- 67. Explain the working of Ruby laser with neat sketch.
- 68. Explain the construction and working of a Geiger-Müller counter.
- 69. Explain the action of an operational amplifer as difference amplifier.
- 70. With the help of a block diagram, explain the function of a RADAR system.