VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST



College with Potential for Excellence

Residential & Autonomous – A Gurukula Institute of Life-Training Re-accredited (3rd Cycle) with 'A' Grade (CGPA 3.59 out of 4.00) by NAAC [Affiliated to Madurai Kamaraj University]

B.Sc. Maths & Chemistry Degree (Semester) Examinations, April 2021 Part – III: Allied Subject: Second Semester: Paper – I ALLIED PHYSICS – II

Under CBCS – Credit 4

Time: 3 Hours

Answer ALL Questions

Max. Marks: 75

<u>SECTION – A</u>

$(10 \times 1 = 10)$

1. The phenomenon of superposition of two coherent waves in the region of superposition

a) Inter	ference b) Reflection	c) Diffraction	d) Polarization
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2. The phenomenon of bending of light waves around corners and their spreading into the geometrical shadow of an object is called

- a) Interference b) Polarization c) Diffraction d) Reflection
- 3. The vector atom model is an extension of _____
- a) Bohr atom model b) Rutherford atom model
- c) Bohr- Sommerfeld atom model d) Thomson atom model
- 4. The limited number of electrons in M shell is
- a) 2 b)8 c)18 d)32
- 5. The formula for mass defect is
- a) M-M b) M-N c) M-A d) N-N
- 6. The energy equivalent of a mass unit is

a) 950.00 MeV b) 931.49 MeV c) 933.12 MeV d) 940.34 MeV

7. According to the theory of relativity, which of the following always remains constant?

a) Length of an object b) time c) space d) velocity of light

8. For length contraction

a) $\ell = \ell_o$	b) $\ell > \ell_{o}$	c) ℓ < ℓ o	d) $\ell x \ell_o$					
9. Which of the following gate having only one input and one output?								
a) AND	b) OR	c) NOT	d) NOR					
10. Zener diodes are used as								
a) rectifier	b) switch	c) voltage regulator	d) oscillator					

<u>SECTION – B</u>

Answer any FIVE Questions	$(5 \times 2 = 10)$
11. What is diffraction grating?	
12. State Pauli exclusion principle.	
13. Define mass defect.	
14. Define Binding energy.	
15. Write down the postulates of theory of relativity.	
16. Draw the logic symbol for AND and OR gate.	
17. What is LED?	

<u>SECTION – C</u>

Answer ALL Questions

 $(5 \times 5 = 25)$

18. a) Descirbe the theory of working of plane transmission grating.

[OR]

b) A parallel beam of monochromatic light is allowed to be incident normally on a plane grating having 1250 lines per cm and a second spectral line is observed to be deviated thorugh 30°. Calculate the wavelength of the spectral line. 19. a) Explain the different quntum numbers associated with the vector atom model.

[OR]

b) The experimental value of Bohr magnetron is 9.21×10^{-24} SI units and planck's constant h=6.6 x 10^{-34} joule second. Calculate the value of e/m of an electron.

20. a) Distinguish between nuclear fission and nuclear fusion

[**OR**]

b) An ionization chamber is connected to an electrometer of capacitance 0.5pF and the voltage sensitivity of 4 divisions per volt. A beam of α particles causes a deflection of 0.8 divisions. Calculate the number of ion pairs required and the energy of the α particles.

Given that 1 ion pair requires energy of 35 eV and $e = 1.6 \times 10^{-19}$ coulomb.

21. a) Derive Einstein mass energy relation

[OR]

b) Calculate the rest energy of an electron in joules and in electron volts.22. a) State and prove DeMorgan's thoerem.

[OR]

b) Prove that (A+B) (A+C) = A+BC

<u>SECTION – D</u>

<u>Answer any THREE Questions</u> $(3 \times 10 = 30)$

23. Explain about the construction and use of a half shade polarimeter to measure the specific rotatory power of a sugar cane solution.

24. Describe Stern and Gerlach experiment and indicate the importance of the results obtained.

25. Describe the liquid drop model of the nucleus. How can the

semiemprical mass formula be derived from it ?

26. Using Lorentz transformation equations explain length contraction and time dilation.

27. Describe how a zener diode can be used as a voltage regulator.

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B.Sc. Physics Degree (Semester) Examinations, April 2021 Part – III: Core Subject: Second Semester: Paper – I

THERMODYNAMICS AND STATISTICAL MECHANICS

Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u>

Answer ALL Questions $(10 \times 1 = 10)$ 1. Unit of thermal conductivity is c) J.ohm/sec.K² a) J/kg.K b) J/mol.K d) W/m.K2. Thermal diffusivity of a substance is a) proportional of thermal conductivity (K) b) inversely proportional to K c) proportional to K^2 d) inversely proportional to K^2 3. According to Van der Waal's gas equation, critical coefficient RT_c/P_cV_c is equal to a) 8 b) 3 c) 3/8 d) 8/3 4. The value of critical volume V_c according to Van der Waal's equation is a) $V_c = b$ b) $V_c = 3b$ c) $V_c = 2b$ d) $V_c = 4b$ 5. In Carnot cycle, the first step is a) isothermal expansion b) isothermal compression c) adiabatic expansion d) adiabatic compression 6. In an isochoric process, which of the following is constant a) volume b) pressure c) temperature d) entropy

7. The value of probability of an event cannot be

	a) negative						
3. The particles obeying Maxwell-Boltzmann statistics are							
a) identical b) id	b) identical and indistinguishable						
c) distinguishable d) id	d) identical and distinguishable						
9. Fermions have spin value							
a) 1/2 b) 1 c) 0	d)2						
10. Which of the following statistics obeys pauli's exclusion principle							
a) M.B. statistics b) F.	b) F.D. statistics						
c) B.E. statistics d) cl	d) classical statistics						

<u>SECTION – B</u>

<u>Answer any FIVE Questions</u> $(5 \times 2 = 10)$

11. State Widemann Franz Law

- 12. What is solar constant?
- 13. Write down the Van der Waals equation of state for a gas.
- 14. State Zeroth law of thermodynamics.
- 15. Define the efficiency of carnot engine.
- 16. What is phase space?
- 17. Define Fermi energy.

Answer ALL Questions

 $(5 \times 5 = 25)$

18. a) Describe Lee's method to find the coefficient of thermal conductivity of metals.

[OR]

- b) The opposite faces of a metal plate of 0.2 cm thickness are at a difference of temperature of 100^{0} C and the area of the plate is 200 sq.cm. Find the quantity of heat will flow through the plate in one minute if K=0.2 CGS units.
- 19. a) Derive and discuss the Van der Waal's equation of sate of a gas.[OR]
 - b) Calculate the values of Van der Waal constants a and b in Van der Waal's equation for He, when critical pressure is $0.23 \times 10^6 \text{ N/m}^2$ and critical volume is 58 X $10^{-8} \text{ m}^3/\text{mol}$, Pc=37.2 atm, R per mole=82.07cm³ atoms K⁻¹.
- 20. a) State and prove Carnot's theorem.

[**OR**]

b) Find the efficiency of a Carnot's engine working between 127°C and 27°C. It absorbs 80 cals of heat. How much heat is rejected.

21. a) Discuss additive law of probability.

[**OR**]

b) An urn contains 4 black and 3 white balls. What is the probability that on two successive draws, the balls drawn are both black?

SECTION – C

22. a) Derive Fermi-dirac distribution law

[OR]

b) Calculate the value of Fermi energy at absolute temperature.

$\underline{SECTION-D}$

Answer any THREE Questions

 $(3 \times 10 = 30)$

23. Discuss in detail about Forbe's method for finding the coefficient of

thermal conductivity of a metal bar.

24. Describe about the porous plug experiment and mention their

conclusions have been drawn from it. What is inversion temperature?

25. Describe Carnot's cycle and obtain an expression for the efficeny of an

ideal heat engine working between $T_1 \mbox{ and } T_2$

26. Derive Maxwell Boltzmann energy distribution law.

27. Compare the Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac Statistics.

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[Affiliated to Madurai Kamaraj University]
 B.Sc. Physics Degree (Semester) Examinations, April 2021
 Part – III: Core Subject: Second Semester: Paper – II

OPTICS AND SOUND

Under CBCS - Credit 4

Time: 3 Hours

Max. Marks: 75

SECTION – A

Answer ALL Questions

 $(10 \times 1 = 10)$

1. The phase difference for constructive interference

- a) 0, 2π , 4π , b) π , 3π , 5π , c) 0, $\pi/2$, π , $3\pi/2$, d) zero
- 2. The ratio between phase difference and path difference is
- a) $\frac{2\pi}{\lambda}$ b) $\frac{\lambda}{2\pi}$ c) $\frac{\pi}{\lambda}$ d) $\frac{3\pi}{\lambda}$
- 3. The bending or spreading of waves that encounter an object in their path is called
- a) Interference b) Diffraction c) Polarization d) refraction
- 4. Dispersion 'D' of a grating is
- a) $\frac{\Delta\theta}{\Delta\lambda}$ b) $\frac{\Delta\lambda}{\Delta\theta}$ c) $\frac{m\lambda}{d}$ d) $\frac{m}{\cos\theta}$

5. Transverse nature of light is best shown by

a) interference b) diffractionb) diffractionc) polarizationd) refractiond) refractione) polarizatione) polarizat

a) velocity b) refractive index c) both a and b d) none

7. The average acceleration in one time period in a simple harmonic motion is a) $A\omega^2$ b) $A\omega^2/2$ c) $A\omega$ d) zero

a) 45° b) 90° c) 120° d) 135°

<u>SECTION – B</u>

Answer any FIVE Questions(5 × 2 = 10)11. Define the term constructive interference.12. Define the term coherence.13. State Bragg's law.14. Define polarization.15. What is a Simple Harmonic Oscillator?

- 16. What is damped harmonic motion?
- 17. Differentiate compressions and rarefactions in sound waves.

<u>SECTION – C</u>

Answer ALL Questions:

 $(5 \times 5 = 25)$

18. a) Write a note on total internal reflection.

[OR]

b) Green light of wavelength 5100 A^0 from a narrow slit is incident on a

double slit. If the overall separation of 10 fringes on a screen 200 cm away

is 2 cm. Find the slit separation.

19. a) Write a note on Holography.

[OR]

b) In a plane transmission grating the angle of diffraction for the second order principal maximum for the wavelength 5×10^{-5} cm is 30^{0} .

Calculate the number of lines in 1 cm of the grating surface.

20. a) Describe the process of polarization by reflection.

[**OR**]

b) Calculate the thickness of double refracting plate capable of producing a path difference of $\lambda/4$ between extraordinary and ordinary waves.

Given: $\lambda = 5890 \text{ A}^0$, $\mu_0 = 1.53$, $\mu_e = 1.54$.

21. a) Describe the working of Simple Pendulum.

[OR]

b) The period of a disk of radius 10.2 cm executing small oscillations about a pivot at its rim is measured to be 0.784 sec. Find the value of g, the acceleration due to gravity at that location. 22. a) Describe the theory of interference in sound waves.

[OR]

b) Spherical sound waves are emitted uniformly in all directions from a point source, the radiated power P being 25 Watt. What are the intensity and the sound level of the sound wave a distance r = 2.5 m from the source?

<u>SECTION – D</u>

Answer any THREE Questions:

 $(3 \times 10 = 30)$

23. Explain the working principle of Michelson's interferometer. Also how

- to measure the changes in the length by means of interference fringes.
- 24. Explain the theory of double slit interference and diffraction combined.
- 25. Illustrate the phenomena of double refraction.
- 26. Compare Simple Harmonic Motion and Uniform Circular Motion.
- 27. Explain sound wave as
- i) pressure wave
- ii) displacement wave

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B.Sc. Physics Degree (Semester) Examinations, April 2021 Part – III: Core Subject: Fourth Semester: Paper – I

ANALOG ELECTRONICS

Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

$\underline{SECTION} - \underline{A}$

Answer ALL	Questions		$(10 \times 1 = 10)$	
1. A crystal diod	le has			
a) one <i>pn</i> junct	ion	b) two <i>pn</i> junctio	ns	
c) three <i>pn</i> june	ctions	d) four <i>pn</i> junction	ons	
2. A Zener diode	e is used as			
a) an amplifier		b) a voltage regu	ılator	
c) a rectifier		d) a multivibrator		
3. The base of a	transistor is	doped		
a) heavily	b) moderately	c) lightly	d) infinitely	
4. In a transistor				
a) $I_c = I_E + I_B$	b) $I_B = I_C + I_E$	c) $I_E = I_C - I_B$	d) $I_E = I_C + I_B$	
5. Transistor bia	sing represents		conditions	
a) a.c	b) d.c	c) both a.c & d.c	d) thermal	
6. The final stag	e of a multistage ampli	fier uses		
a) RC coupling	7	b) transformer		
c) direct coupli	ing	d) impedance cou	ıpling	

7. All Oscillator converts	7.	An	oscil	lator	conv	rts
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a) a.c. power into d.c. power	b) d.c. power into a.c. power	Answer ALL Questions		
c) mechanical power into a.c. power	d) d.c. to oscillation	18 a) Derive an expression for the ϵ		
8. The Q of a crystal is of the order of				
a) 100 b) 1000 c) 50	0 d) more than 10,000			
9. Modulation is done in		b) A full-wave rectifier uses two		
a) transmitter	b) radio receiver	diode may be assumed constant a		
c) between transmitter and radio rece	eiver	voltage from centre tap to eac		
d) transreceiver	resistance is 980 Ω . Find			
10. The major advantage of FM over A	AM is	i) the mean load current		
a) reception is less noisy	b) higher carrier frequency	19. a) Write a brief note on transisto		
c) smaller bandwidth	d) small frequency deviation	[OR]		
c) smaller bandwidth	d) shan nequency deviation	b) A JFET has a drain current of		
<u>SECTI</u>	<u>ON – B</u>	$V_{GS(off)} = -6V$, find the value of		
Answer any FIVE Ouestions	$(5 \times 2 = 10)$	20. a) Describe the base resistor met		
, · · · · · · · · · · · · · · · · ·		[OR]		
11. Define the term rectifier efficiency	ý.	b) In a transistor amplifier when		
12. What is operating point?		current changes by $10 \ \mu A$ and co		
13. What do you meant by transistor b	R_C = 5 k Ω and R_L = 10 k Ω find:			
	ii) input impedance iii) a.c. lo			
14. Give the two advantages of phase	21. a) With a neat diagram, explain			
15. Define modulation		[OR]		
16 What is right factor?		b) A 1 pF capacitor is available.		

16. What is ripple factor?

17. Draw the symbol of n-channel and p-channel JFET

<u>SECTION – C</u>

 $(5 \times 5 = 25)$

oscillator so that $f=1\ \text{MHz}$ and $m_v=0.2$

22. a) Explain the general principles of radio broadcasting, transmission and reception

[OR]

b) The r.m.s. value of carrier voltage is 100 V. After amplitude modulation

by a sinusoidal of voltage, the r.m.s. value becomes 110 V.

Calculate the modulation index

<u>SECTION – D</u>

<u>Answer any THREE Questions</u> $(3 \times 10 = 30)$

- 23. Describe the action of the following filter circuits:
- i) capacitor filter
- ii) choke input filter

iii) capacitor input filter

- 24. Briefly explain the construction and working of a JFET
- 25. Discuss in detail about the RC coupled transistor amplifier with a neat

circuit diagram

- 26. Describe the OP-AMP applications
- 27. Explain the amplitude modulation and its limitations

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B.Sc. Physics Degree (Semester) Examinations, April 2021

Part – III: Core Subject: Fourth Semester: Paper – II

NUMERICAL METHODS

Under CBCS - Credit 4

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u>

Answer ALL Questions

c) Method of false position

 $(10 \times 1 = 10)$

- 1. Newton Raphson method is also called
- a) Method of tangentsc) Bisection method

- b) Method of Chordsd) All the above
- u) All ule at
- 2. Regula Falsi method is also known as a _a) Method of tangentsb) M
 - b) Method of chords
 - d) Method of slopes
- 3. Gauss-Elimination method of solving Simultaneous Linear Algebraic Equation is
- a) direct methodb) indirect methodc) iterative methodd) interactive method
- 4. To ensure that the following system of equations,

$$2x_1 + 7x_2 - 11x_3 = 6$$

$$x_1 + 2x_2 + x_3 = -5$$

 $7x_1 + 5x_2 + 2x_3 = 17$

converges using Gauss-Seidel Method, one can rewrite the above equations as follows:

a)
$$\begin{bmatrix} 2 & 7 & -11 \\ 1 & 2 & 1 \\ 7 & 5 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$$

b) $\begin{bmatrix} 7 & 5 & 2 \\ 1 & 2 & 1 \\ 2 & 7 & -11 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 17 \\ -5 \\ 6 \end{bmatrix}$
c) $\begin{bmatrix} 7 & 5 & 2 \\ 1 & 2 & 1 \\ 2 & 7 & -11 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -5 \\ 17 \end{bmatrix}$

d) The equations cannot be rewritten in a form to ensure convergence

5. Gauss forward interpolation formula is applicable if u is ______
a) zero
b) one
c) between 0 and 1
d) greater than 1
6. Newton's forward interpolation formula is used to interpolate the value of y is ______

- a) nearer to the beginning b) nearer to the end c) nearer to the middle d) nearer to one third 7. In Interpolation techniques the value of u is given by a) $u = (x - x_0) / h$ b) $u = (x_0 - h) / x$ c) $u = h x / x_0$ d) $u = x x_0 / h$ 8. In Simpson's (1/3)rd Rule the number of intervals b) even c) multiple of 3 d) multiple of 6 a) odd 9. The differential equation $2\frac{dy}{dx} + x^2y = 2x + 3$, y(0) = 5 is b) nonlinear a) linear c) linear with fixed constants d) undeterminable to be linear or nonlinear 10. In which of the following method, we approximate the curve of solution by the tangent in each interval. a) Picard's method b) Runge-Kutta method
- c) Newton's method

b) Runge-Kutta meth d) Euler's method

<u>SECTION – B</u>

Answer any FIVE Questions

- 11. Give an example for transcendental equation.
- 12. Write down the iterative formula of Newton-Raphson method.
- 13. What do you mean by Simultaneous Linear Algebraic Equations?
- 14. How do you find the solution of simultaneous linear algebraic equations by Gauss-Elimination method?
- 15. Give the main features of Gregory-Newton's forward interpolation formula.
- 16. Write down the Newton-Cote's quadrature formula.
- 17. Write down the equations of Second order Runge-Kutta algorithm

Answer ALL Questions

 $(5 \times 5 = 25)$

18. a) Find the positive root of $x - \cos x = 0$ by bisection method.

[OR]

b) Find the positive root of $f(x) = 2x^3 - 3x - 6 = 0$ by Newton-Raphson method correct to five decimal places.

SECTION – C

19. a) Solve the system of equations by Gauss-Elimination method

x + 2y + z = 3 2x + 3y + 3z = 103x - y + 2z = 13

[OR]

b) Solve by Gauss-Seidel method, the following system

28x + 4y - z = 32x + 3y + 10z = 242x + 17y + 4z = 35

20. From the following table of half-yearly premium for policies maturing

at different ages, estimate the premium for polices maturing at age 46 and 63

Age x :	45	50	55	60	65
Premium y :	114.84	96.16	83.32	74.48	68.48

[OR]

b) Apply Gauss's forward formula to find f(x) at x = 3.5 from the table below

x :	2	3	4	5
f (x) :	2.626	3.454	4.784	6.986

 $(5 \times 2 = 10)$

21. a) The table given below reveals the velocity 'v' of a body during the time 't' specified. Find its acceleration at t = 1.1.

t :	1.0	1.1	1.2	1.3	1.4
v :	43.1	47.7	52.1	56.4	60.8
		[OR]			

b) Evaluate $\int_{-3}^{3} x^4 dx$ using i) Trapezoidal rule ii) Simpson's rule 22. a) Using Taylor series method, find correct to four decimal places, the value of y(0.1), given dy / dx = x² + y² and y(0) =1.

[OR]

b) Using Euler's method, Solve numerically the equation y' = x + y, y(0) = 1 for x = 0.0 (0.2) (1.0). Check your answer with exact solution.

<u>SECTION – D</u>

Answer any THREE Questions:

 $(3 \times 10 = 30)$

23. Solve $e^x - 3x = 0$ by the method of iteration.

24. Solve by Gauss-Elimination method

$$3x + 4y + 5z = 182x - y + 8z = 135x - 2y + 7z = 20$$

25. Find the values of y at x = 21 and x = 28 from the following data

x :	20	23	26	29
v :	0.3420	0.3907	0.4384	0.4848

26. Evaluate the integral I = $\int_{4}^{5.2} \log_{e}^{x} dx$ using Trapezoidal and Simpson's rules.

27. Solve dy / dx = x + y given y(1) = 0 and get y(1.1), y(1.2) by Taylor series method.





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B.Sc. Physics Degree (Semester) Examinations, April 2021 Part - III: Core Subject: Sixth Semester: Paper - I

NUCLEAR PHYSICS

Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

SECTION – A

Answer ALL	<u>Questions</u>		$(10 \times 1 = 10)$
1. The empirical	formula for the nuclear	radius (R) is	
a) $r_0 A^{2/3}$	b) $r_0 A^{1/3}$	c) $r_0 A^{5/3}$	d) $r_0 A^{9/3}$
2. The Betatron	is a device to accelerate		
a) protons	b) electrons	c) neutrons	d) mesons
3. The Geiger-N	uttal law is		
a) $\log \lambda = A + 1$	B log C	b) $\log \lambda = A + 2$	B log R
c) $\log \lambda = A + 1$	$\log \lambda = A + B \log N$ d) $\log \lambda = A + B \log M$		B log M
4. Radioactivity	was discovered by		
a) Henri Becqe	rel b) Rutherford	c) Maxwell	d) Bohr
5. The half-life of	of neutron is		
a) 13 hours	b) 13 minutes	c) 13 seconds	d) 13 days
6. Isotope of car	bon used for archaeolog	gical dating is	
a) C ¹³	b) C ¹²	c) C ¹⁴	d) C ¹¹
7. Which of the	following part in a nucle	ear reactor minir	nizes the neutron
leakage?			
a) shield	b) control rods	c) reflector	d) moderator

8.	What	type	of	reaction	takes	place	in	sun?
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a) spontaneous fission		b) nuclear fission		
c) nuclear fusion		d) double beta decay		
9. What type of	elementary particles are	e electrons?		
a) Quarks	b) Photons	c) Leptons	d) Gluons	
10. What particl	e is made up of two 'do	wn' quarks and o	one 'up' quark?	
a) atom	b) proton	c) neutron	d) electron	

<u>SECTION – B</u>

Answer any FIVE Questions	$(5 \times 2 = 10)$
11. Distinguish between isotones and isomers.	
12. What is packing fraction of a nucleus?	
13. Define Half life period.	
14. State the Geiger's law.	
15. Define threshold energy.	
16. What is chain reaction in nuclear reactor?	
17. State Hubble's law.	
SECTION – C	

Answer ALL Questions

18. a) Explain Yukawa's meson theory of nuclear forces.

[**OR**]

b) A cyclotron in which the flux density is 1.4 T is employed to accelerate proton. How rapidly should the electric field between the dees be reversed? Mass of the proton = 1.67×10^{-27} kg and charge = 1.6×10^{-19} C

 $(5 \times 5 = 25)$

19. a) Describe experiment to determine the wavelength of gamma rays.

[OR]

b) 1 gram of radium is reduced by 2.1 mg in 5 years by α – decay. Calculate the half life period of radium.

20. a) Write the basic properties of the neutron.

[OR]

b) The Q value of the Na^{23} (n, α) F^{20} reaction is -5.4MeV. Determine the threshold energy of the neutron for this reaction.

[Given : mass of incident = 1.008665u and mass of target = 22.9898 u]

21. a) Discuss the Bohr Wheeler theory of nuclear fission.

[OR]

b) A reactor is developing energy at the rate of 300 kW. How many atoms of U^{235} undergo fission per second? How many kilogram of U^{235} would be used in 1000 hours of operation that on an average energy of 200 MeV is released per fission.

22. a) Summaries the four basic fundamental interactions between the elementary particles

[OR]

b) Using the baryon number and the strangeness number conservation laws, find which of the following reactions is allowed:

i)
$$\pi - p \rightarrow \Lambda^0 + K^0$$

ii) $\pi^{-} + p \rightarrow \Lambda^{0} + \pi^{0}$

<u>SECTION – D</u>

Answer any THREE Questions

 $(3 \times 10 = 30)$

- 23. Explain liquid drop model of the nucleus brining out the analogies
- between a small drop of a liquid and a nucleus.
- 24. Compare the properties of alpha, beta and gamma particles.
- 25. Explain the applications of radio isotopes.
- 26. Describe the construction and working of a nuclear reactor to generate

electric power.

27. Explain about the theory of Quark model and its compositions in detail.



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B.Sc. Phys

B.Sc. Physics Degree (Semester) Examinations, April 2021 Part – III: Elective Subject: Sixth Semester: Paper – I

QUANTUM MECHANICS AND RELATIVITY

Under CBCS – Credit 5

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u>

Answer ALL Questions:

 $(10 \times 1 = 10)$

1. For an electron, the	minimum energy needed	l to escape from a	a particular
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metal surface is called		_ of the metal.		
a) work function		b) ionization energy		
c) quantum ener	зу	d) potential ener	rgy	
2. Momentum of	a massless particle is re	elated to its energ	gy by E =	
a) p / c	b) pc	c) c / p	d) pc^2	
3. The quantity w	hose variations make u	p matter waves i	s called	
a) pressure		b) electric field		
c) magnetic field		d) wave function		
4. de Broglie's wa	ave velocity or phase v	elocity V _p =		
a) c^2 / v	b) c / v	c) v / c	d) c v	
5. Uncertainty in	energy and time is give	en by		
a) $\Delta E \Delta t = \hbar / 2$	b) $\Delta E \Delta t = \hbar$	c) $\Delta E \Delta t \ge \hbar / 2$	d) $\Delta E \Delta t = 0$	
6. Total energy op	perator is defined as			
a) i ħ∂/∂t	b) ħ ∂/∂t	c) i ∂/∂t	d) (ħ / i) ∂/∂t	
7. Steady state Schrodinger's equation using Hamiltonian operator is			n operator is	
a) H $\psi_n = E_n \psi_n$	b) H $\psi_n = U_n \ \psi_n$	c) H $\psi_n = T_n \psi_r$	d) H $\psi_n = V_n \psi_n$	

8. Energy levels are equally spaced in the case of _____

- a) hydrogen atom b) particle in a box
- c) harmonic oscillator

d) all the above

 $(5 \times 2 = 10)$

9. Length contraction happens only

a) perpendicular to direction of motion b) along the direction of motion

c) parallel to direction of motion d) parallel to the Z axis

10. An object moving with the speed of light, the mass of an object is

a) zero b) infinity c) finite d) not measurable

<u>SECTION – B</u>

Answer any FIVE Questions

11. What is photoelectric effect?

12. What do you understand by the term "photoelectric cell"? Mention the three types of photoelectric cells.

13. Distinguish dispersive and nondispersive medium based on the concept of phase velocity and group velocity.

14. Write down the Schrodinger's time dependent and time independent equation in three dimensions.

15. What is wavefunction? Discuss the properties of wavefunctions.

16. Express the equation of continuity of probability density.

17. What is meant by frame of reference? Define inertial and non-inertial frames.

<u>SECTION – C</u>

Answer ALL Questions

 $(5 \times 5 = 25)$

18. a) With necessary theory, explain the Millikan's experimental verification of Einstein's photoelectric equation.

[OR]

b) The photoelectric threshold for a metal is 3000 Å. Find the kinetic energy of the electron ejected from it by radiation of wavelength 1200 Å.

19. a) Give an account of Heisenberg's uncertainty principle. Outline an idealized experiment to bring out its significance.

[OR]

- b) Find the de Broglie wavelength associated with (i) A 46 gm golf ball with velocity 36 m/s. (ii) an electron with a velocity of 10^7 m/s. Which one of these two show wave character and why?
- 20. a) Setup the Schrodinger's equation for a one-dimensional potential barrier and obtain the expression for transmission co-efficient.

[OR]

- b) Calculate the expectation values of position and momentum of a particle trapped in a one-dimensional box.
- 21. a) Explain the importance of various postulates of Quantum Mechanics. **[OR]**

b) Explain the significance of probability current density in Quantum Mechanics.

22. a) Derive the Lorentz transformation equations.

[OR]

b) How fast would rocket have to go relative to an observer for its length to be contracted to 99% of its length at rest?

<u>SECTION – D</u>

Answer any THREE Questions

 $(3 \times 10 = 30)$

- 23. Describe the Richardson and Compton experiment and explain the observations made from the experiment. State the laws of photoelectric emission.
- 24. Describe the Davisson and Germer experiment on the diffraction of

electrons and explain the significance of the results.

- 25. Formulate the Schrodinger's equation for a linear harmonic oscillator and solve it to obtain its energy eigen values and eigen functions.
- 26. Setup the Schrodinger's equation and obtain the values of the energy for
- a particle trapped in a square well of three-dimensions.
- 27. Describe the Michelson-Morley experiment and explain the physical significance of negative results obtained.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST



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B.A. & B.Sc. Degree (Semester) Examinations, April 2021 Part – IV: Non-Major Elective Subject: Second Semester: Paper – I

ELECTRICAL HOME APPLIANCES Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

SECTION – A

Answer ALL Questions

 $(10 \times 1 = 10)$

	Juconons		$(10 \times 1 - 10)$
1. A wire coming	g from the ground from	an electrode plat	te is
a) Transformer	b) Earthing	c) lamp	d) heater
2. Name the elec	trolyte used in the lead	acid cell	
a) NH ₄ Cl	b) H ₂ SO ₄	c) HCl	d) D ₂ O
3. The compositi	ion of fuse wire is		
a) Lead + Tin	b) Zinc + Tin	c) Boron + lead	d) Lead + Zinc
4. Multimeter me	easure		
a) Voltage	b) Current	c) Resistance	d) all
5. Ohm's law is			
a) V=I x R	b) $R = V/I$	c) $I = V/R$	d) R= VI
6. LED stands for	or		
a) Light Emitting diode		b) Light Emission diode	
c) Light Emitting detector		d) Light Effective diode	
7. The Mica is an	n example for		
a) Conductors		b) Insulators	
c) Semiconduct	tors	d) Resistance	

8. One Horse P	ower is			19. a) Differentiate b
a) 476 Watt	b) 746 watt	c) 647 watt	d) 647 watt	
9. Which of the	e following used for	control the electric fire		b) Explain about I
a) sand	b) water	c) woolen cloth	d) acid	20. a) Explain the con
10. Multimeter	measure			mixer.
a) voltage	b) current	c) resistance	d) all	
	SEC	TION – B		b) Explain about t
Answer any I	FIVE Questions		$(5 \times 2 = 10)$	
11. What is a f	fuse?			Answer any TWO (
12. What is A.	.C?			Answer any Two
13. What is D.	.C?			21. What is eartning?
14. What is a t	transformer?			electrical appliance
15. List out the	e types of transform	ner.		22. Briefly describe a
16. What is ch	oke?			22. Brieffy deserve e
17. Darw the s	symbol for			mention its advanta
i) a.c	ii) earth			23. Discuss briefly at
	<u>SEC</u>	TION – C		24. Discuss about the
Answer ALL	Questions		$(3 \times 9 = 27)$	
18. a) What pr	recautions should b	e observed while wor	king or handling	
the electric	al appliances and e	quipments in home?		
	[OR]			

b) Explain about the Single, two and three phase power supply.

etween A.C and D.C

[OR]

LED and its functions.

nstruction and operating instructions of electric

[**OR**]

he parts and function of iron box.

<u>SECTION – D</u>

<u>Questions</u>

 $(2 \times 14 = 28)$

What is the necessity of earthing using in the

s and machines.

about the construction of transformer and also iges.

- bout the various types of lamp.
- electric and water heater.





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B.Sc. Physics Degree (Semester) Examinations, April 2021 Part – IV: Skill Based Subject: Fourth Semester: Paper – I ASTROPHYSICS

Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

<u>SECTION – A</u>

Answer ALL Questions

 $(10 \times 1 = 10)$

- 1. When the Moon's shadow crosses the Earth's surface, the eclipse occurred is
- a) Solar eclipse b) lunar eclipse c) blue moon d) super nova
- 2. Most familiar and characteristics features on the moon are its

a) Mountains	b) craters	c) maria	d) volcanoes
3. The dark region	of sunspot is		
a) chromosphere		b) umbra	
c) photosphere		d) transition region.	

4. The temperature of the corona is

a) 15MK	b) 2 MK	c) 4 MK	d) 6 MK
5. A white dwa	arf is	star	
a) new born	b) dead	c) living	d) burst
6. A star emits	its maximum energy	at	wavelength.
a) short	b) long	c) medium	d) ratio
7. Mass of our	galaxy is about	billion tir	nes that of the sun.
a) 200	b) 250	c) 100	d) 100

- 8. The spiral galaxies according to their size of the nuclei are classified into three groups
- a) b,c,d b) a,d,c c) a,b,d d) a,b,c
- 9. The ability of a telescope to separate the angular distance between neighbouting stars is called
- a) dispersive power b) dispersion
- c) resolving power d) resolution
- 10. The size of the image increases as the _____increases
- a) focal point b) focal length c) focal ration d) focal value

<u>SECTION – B</u>

Answer any FIVE Questions	$(5 \times 2 = 10)$
11. What is maria?	
12. What is sunspot?	
13. Define Protostar.	
14. What is a Star model?	
15. What are irregular galaxies?	
16. List out the four catergories of galaxies.	

17. What is a radio telescope?

<u>SECTION – C</u>

Answer ALL Questions

 $(3 \times 9 = 27)$

18. a) Explain solar and lunar eclipse with neat diagram.

[OR]

- b) Explain sunspot cycle in detail.
- 19. a) Derive the expression for luminosity of a star.

[OR]

- b) Explain strcture of milky way galaxy with suitable diagram.
- 20. a) Compare between the reflecting and refracting telescope.

[OR]

b) Explain the atmosphere of the earth.

<u>SECTION – D</u>

Answer any TWO Questions

 $(2 \times 14 = 28)$

- 21. Explain Big Bang theory in detail.
- 22. Explain about the different stages of star.
- 23. Mention the classification of galaxies and explain its struture with relavant diagram.
- 24. Explain refracting and reflecting telescopes in detail.





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B.Sc. Physics Degree (Semester) Examinations, April 2021 Part - IV: Skill Based Subject: Sixth Semester: Paper - I

NANOTECHNOLOGY

Under CBCS - Credit 2

Max. Marks: 75

SECTION – A

Answer ALL Ouestions

c) Mechanical grinding

 $(10 \times 1 = 10)$

- 1. Who first used the term Nanotechnology?
- a) Richard Feymann b) Norio Taniguichi
- c) Eric Drexler d) Sumio Lijima

2. Which of the following is an example of top-down approach for the preparation of nanomaterials?

- a) Gas phase agglomeration b) Molecular self-assembly
 - d) Molecular beam epitaxy

3. "There is plenty of room at the bottom". This was stated by

a) Eric Drexler b) Richard Feymann c) Harold Croto d) Richard Smalley

4. Nanoscience can be studied with the help of _____

- a) Quantum mechanics b) Newtonian mechanics
 - d) Geophysics
- 5. The size of nano particle is between_ nm

a) 100 to 1000 b) 0.1 to 10

c)1 to 100 d) 0.01 to 1

6. What is graphene?

c) Macro-dynamics

a) a new material made from carbon nanotubes

b) a one-atom thick sheet of carbon

Time: 2 Hours

- c) thin film made from fullerenes
- d) a software tool to measure and graphically represent nanoparticles
- 7. Sol-gel is _____ approach
- a) Bottom-up b) Top-Down
- c) sputtering d) chemical vapour deposition
- 8. Sputtering is a_____
- a) Physical Vapour deposition method
- b) Chemical vapour deposition method
- c) Chemical precipitation method
- d) Chemical bath deposition method
- 9. An important consequence of using the UV-Visible spectroscopy is that
 - _____ of bonding structure
- a) nanomaterial can be determinedb) emission wavelengthd) Band gap
- e) exertation wavelength a) build g
- 10. The power required for electro-deposition is
- a) DC and very low voltage b) DC and high voltage
- c) AC and very low voltage

<u>SECTION – B</u>

d) AC and high voltage

 $(5 \times 2 = 10)$

Answer any FIVE Questions

- 11. What is nanotechnology?
- 12. What is nanomaterial?
- 13. List out the physica and chemical properties of nanomaterial.
- 14. What is nanocomposite?
- 15. List out the types of nanocomposite.

- 16. What are the different synthesis methods of nanomaterial?
- 17. What is electrodeposition?

$\underline{SECTION - C}$

Answer ALL Questions

 $(3 \times 9 = 27)$

 a) Explain the role of bottom up and top down approaches in nanotechnology.

[**OR**]

- b) Explain spray pyrloysis techniques.
- 19. a) Explain the X-ray diffraction techniques in detail.

[OR]

- b) Discuss briefly about the crystal strctures of a material.
- 20. a) Describe about UV-Visible spectroscopic techniques in optical chaarcterization.

[OR]

b) Explain abou the applications of nanoparticles in biology and medicine.

<u>SECTION – D</u>

Answer any TWO Questions

- $(2 \times 14 = 28)$
- 21. Explain about the sol gel process in detail.
- 22. Give a brief account on properties of nanomaterials.
- 23. Describe the surface morphological features using SEM techniques.
- 24. Discuss briefly about the applications of nanomaterials.
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B.Sc. Physics Degree (Semester) Examinations, April 2021 Part – IV: Skill Based Subject: Sixth Semester: Paper – II

PHYSICS FOR COMPETITIVE EXAMINATIONS

Under CBCS – Credit 2

Time: 2 HoursMax. Marks: 75

<u>SECTION – A</u>

Answer ALL	Questions		$(75 \times 1 = 75)$	
1. The unit of po	ower is			
a) kilowatt	b) kilowatt-hour	c) dyne	d) Joule	
2. The SI unit of	f universal gas constan	t (R) is		
a) JK ⁻¹ mol ⁻¹	b) NK ⁻¹ mol ⁻¹	c) WattK ⁻¹ mol	-1 d) $\operatorname{erg} K^{-1} \operatorname{mol}^{-1}$	
3. The dimensio	onal formula for Planck	x's constant (h) is		
a) [ML ² T ⁻³]	b) [ML ² T ⁻²]	c) $[ML^2T^{-1}]$	d) [ML ⁻² T ⁻²]	
4. If C and R denote capacity and resistance, the dimension of CR is				
a) $M^0 L^0 T^1$		b) $M^1L^0 T^1$		
c) $M^0 L^0 T^0$	d) not expressible in	n terms of M LT		
5. Poise is the u	nit to measure			
a) coefficient of	of viscosity	b) surface tens	ion	
c) torque		d) moment of i	nertia	
6. Newton's firs	st law of motion gives	the concept of		
a) energy	b) work	c) inertia	d) momentum	
7. Two bodies o	of mass 1 kg and 4 kg a	re moving with ea	qual kinetic	
energies. The	ratio of their linear mo	mentum is		
a) 1:2	b) 2:1	c) 4:1	d) 1:4	

- 8. When the amplitude of a particle executing S.H.M. increases, its time period
- a) decreases b) remains unchanged c) increases
- d) may increase or decrease depending upon phase
- 9. A loaded spring vibrates with a period T. The spring is now divided into nine equal parts and the same load is suspended from one of these parts.
- The new period is
- a) T/3 b) T/9 c) 3T d) T
- 10. The equivalence of two systems in thermal equilibrium is represented by the property
- a) temperature b) heat c) specific heat d) energy
- 11. An ideal gas heat engine operates in a Carnot cycle between 227 $^{\circ}$ C and 127 $^{\circ}$ C. It absorbs 6 X 10⁴ cals at the higher temperature. The amount of heat converted into work is equal to
- a) 4.8×10^4 cals b) 3.5×10^4 cals c) 1.6×10^4 cals d) 1.2×10^4 cals
- 12. The area under the curve on P-V diagram represents
- a) work done on or by the system b) work done in a cyclic process
- c) the thermodynamic process d) the condition of the system
- 13. The triple point of a substance is the temperature at which
- a) the liquid and the gas phases are in equilibrium
- b) the solid and the gas phases are in equilibrium
- c) the solid and the liquid phases are in equilibrium
- d) all the three phases are in equilibrium
- 14. A perfect gas is compressed to ¹/₄ th of its original volume. The initial pressure of the gas is 1 atm. If the compression is isothermal, the final pressure will be
- a) 4 atm b) ¹/₄ atm c) 16 atm d) 1/16 atm

- 15. The freezer in a refrigerator is located in the top section so that
- a) the entire chamber of the refrigerator is cooled quickly
- b) motor is not heated
- c) heat gained from environment is less
- d) heat gained from environment is more
- 16. The radiation emitted by a perfectly black body is proportional to
- a) temperature on the ideal gas scale
- b) fourth root of temperature on ideal gas scale
- c) fourth power of temperature on ideal gas scale
- d) source of temperature on ideal gas scale
- 17. Prof. S. N. Bose's contribution was to give
- a) A derivation of Kirchhoff's law
- b) A suggestion that bodies emit and absorb radiations at all temperatures
- c) A definition of black body
- d) A rigorous derivation of Planck law
- 18. Quantum nature of light is not supported by the phenomenon of
- a) Compton effect b) photoelectric effect
- c) emission or absorption spectrum d) interference of light waves
- 19. The energy and momentum of a photon are given by E=hv and P=h/ λ respectively. Velocity of the photon will be
- a) EP b) E/P c) P/E d) E/P^2
- 20. The frequency of a light wave is 6.4 X 10^{14} Hz. Its energy in eV will be (h=6.6 X 10^{-34} J-sec)
- a) 5.28 eV b) 3.96 eV c) 2.64 eV d) 1.32 eV

21. Two coherent sources of light produce interference (destructive) when the phase difference between them is

a) 2π b) $3\pi/2$ c) π d) $\pi/2$

22. In Young's two slits interference experiment if the distance between the silts is made 3 fold, the fringe width becomes

a) 1/3 fold b) 2 fold c) 1/9 fold d) 9 fold

23. Hardness of magnetic material is measured by the value of

a) magnetic induction b) intensity of magnetisation

c) density of magnetic material d) coercive force

24. Curie temperature is that temperature at which the ferromagnetic material

- a) has maximum susceptibility b) has zero susceptibility
- c) loses its ferromagnetism d) develops reverse polarity

25. A circular coil of radius 4 cm having 50 turns carries a current of 2A. It is placed in uniform magnetic field of 0.1 wb/m^2 . The work done to rotate the coil from equilibrium position by 180° is

a) 0.1 J b) 0.2 J c) 0.4 J d) 0.8 J

26. F_g and $F_e\,$ represent the gravitational and electrostatic forces respectively between electrons situated at some distance. The ratio of $F_g/F_e\,$ is of the order of

a) 1 b) 10 c) 10^{-43} d) 10^{-37}

27. When the distance between two charged particles is halved, the force between them becomes

a) one-fourth b) one-half c) double d) four times 28. A dipole of electric dipole moment P is placed in a uniform electric field of strength E. If θ is the angle between positive directions of P and E, then the potential energy of the electric dipole is largest when θ is a) zero b) $\pi/2$ c) π d) $\pi/4$

29. Electric potential due to a point charge and a dipole respectively are						
directly propo	rtional to	-)	-1)22			
a) Γ^{-} , Γ^{-} 30. The velocit	D) I ⁻ , I ⁻ v of an electron which	c) r^{-} , r^{-}	a) r^{-}, r^{-}			
		passes unough a	a potential difference			
of 1000 volts	15		_			
a) 1.87 X 10 ⁷	m/s	b) 18.7 X 10	b) 18.7 X 10 ⁷ m/s			
c) 0.187 X 10	⁷ m/s	d) 187 X 10 ⁷	′m/s			
31. A condense	er is charged through a	potential differe	nce of 200 volts and			
possesses a ch	narge of 0.1 Coulomb.	When discharge	d it would release an			
energy of						
a) 1 J	b) 2 J	c) 10 J	d) 20 J			
32. Three cond	ensers of capacitances	10, 20 and 30 µl	F are first connected			
in series and t	hen connected in paral	lel. The ratio of	the resultant			
capacitances in the two cases is						
a) 1:11	b) 11:1	c) 1:6	d) 6:1			
33. The capacity of a parallel plate capacitor is 4 μ F. The distance between						
the plates is d	oubled. The new capac	city is				
a) 8 µF	b) 4 μF	c) 2 µF	d) 1 μF			
34. n similar resistors each of resistance r when connected in parallel has						
the total resistance R. When these resistances are connected in series, the						
total resistance will be						
a) n ² R	b) nR	c) R/n	d) R/n ²			
35. In a Wheatstone bridge the resistances in the ratio arms are 100 Ω and						
150 Ω respectively. If R= 80 Ω , the resistance of the fourth arm will be						
a) 120 Ω	b) 80 Ω	c) 150 Ω	d) 70 Ω			

20		C	11 1	•	•		.1	• ,	1
36	WO	tree	narallel	WITES	carrying	currents ir	the	onnosite	direction
50.	1 W U	nuc	paranci	wittes	carrying	currents n	i uic	opposite	uncenon
			1		1 0			11	

a) attract each other b) repel each other

- c) do not affect each other
- d) get rotated to be perpendicular to each other
- 37. The current in an inductor is reduced to half. The energy stored in ita) is doubled
- b) reduces to one-fourth of its initial value
- c) remains unchanged
- d) reduces to half of its initial value
- 38. The velocity of certain ions that pass undeflected through crossed E and B fields for which E = 7.7 kV/m and B = 0.14 T
- a) 22 km/s b) 33 km/s c) 44 km/s d) 55 km/s
- 39. A coil of 20 turns has an area of 800 mm² and bears a current of 0.5 A.
- It is placed with its plane parallel to a magnetic field of intensity 0.3 T.
- The torque on the coil is
- a) 2.4 X 10⁻¹ N-m b) 2.4 X 10⁻² N-m
- c) 2.4 X 10^{-3} N-m d) 2.4 X 10^{-4} N-m
- 40. In a potentiometer, the length of its wire is doubled. The accuracy in determining the null point will
- a) decrease
- b) increase
- c) remain unchanged d) be equal to zero.
- 41. When different parts of a metal are kept at different temperatures and current is passed through it, the heat is either evolved or absorbed. The effect is called
- a) Peltier effect b) Seebeck effect c) Thomson effect d) Joule effect

- 42. A straight line conductor of length 0.4 m is moved with a speed of 7 m/s perpendicular to a magnetic field of intensity 0.9 wb/m². The induced e.m.f. across the conductor is
- a) 5.04 V b) 1.26 V c) 2.52 V d) 25.2 V
- 43. Which of the following phenomena is utilised in the construction of the mouth-piece of a telephone?
- a) electromagnetic induction b) heating effect of electric current
- c) change of resistance with temperature d) rectification
- 44. To step up the voltage, the number of turns in the secondary should be
- a) less than the number of turns in the primary
- b) greater than the number of turns in the primary
- c) equal to the number of turns in the primary d) infinite
- 45. Core of a transformer is made of soft iron and laminated to
- a) reduce the heat loss b) reduce the eddy current loss
- c) reduce circuit permeability
- d) make assembly cheap and convenient
- 46. Reactance offered by a coil having no resistance in an a.c. circuit is equal to

a) ωL b)1/ ωL c) $\omega^2 L^2$ d) $\omega L R$

47. An inductance of 0.4 Henry and a resistance of 100 Ω are connected in series with an A. C. supply of 220 volts, 50 c.p.s. Phase lag of current from e.m.f. applies is

a) $\tan^{-1}(\pi)$ b) $\tan^{-1}(0.4\pi)$ c) $\tan^{-1}(4\pi)$ d) $\tan^{-1}(0.2\pi)$

48. A student has a coil of 3 mH and wishes to construct a circuit whose resonant frequency is 1000 kHz. The value of capacitor he must use is

about (pico=10-	¹²)				
a) 8.5 pico farad		b) 0.8 pico farad			
c) 85 pico farad		d) 850 pico fara	ad		
49. In an LCR-series circuit $R = \sqrt{3} \Omega$, $X_L = 10 \Omega$, $X_C = 11 \Omega$, the					
voltage is 10 Volt (R.M.S). The impedance of the circuit is					
a) 8 Ω	b) 4 Ω	c) 2 Ω	d) 1 Ω		
50. If E _{rms} , be the	R.M.S value of e.m.f,	then its peak-to-pe	eak value is given by		
a) $E_{rms}/\sqrt{2}$	b) $\sqrt{2} E_{\rm rms}$	c) $2\sqrt{2} E_{rms}$	d) $E_{rms}/2$		
51. The electron l	beam with velocities in	the ratio 1:2 is s	subjected to		
identical magne	tic fields at right angles	s to them. The ra	tio of the		
deflections prod	luced will be				
a) 1:2	b) 2:1	c) 1:4	d) 4:1		
52. If elements with principal quantum number $n > 4$ were not allowed in					
nature, the num	ber of possible element	s would be			
a) 60	b) 32	c) 4	d) 64		
53. A proton, deuteron, and an α – particle are accelerated by the same					
potential differe	nce. Their velocities w	ill be in the ratio	of		
a) 1:1:1	b) √2:1:1	c) 1:1:√2	d) 1:√2:1		
54. "There are dis	screte energy levels in	atoms and molec	cules" was first		
demonstrated experimentally by					
a) Frank Hertz experiment					
b) Rutherford alpha scattering experiment					
c) Davisson and Germer's experiment d) G.P. Thomson's experiment					
55. The order of wavelength of X-rays is					
a) 10 ⁻¹⁰ m	b) 10 ⁻⁸ m	c) 10 ⁻¹² m	d) 10 ⁻¹⁴ m		

- 56. The velocity of the photoelectrons depends upon
- a) frequency of the incident photon only
- b) intensity of the incident photon only
- c) intensity as well as frequency of the incident photon
- d) kinetic energy of the incident photon
- 57. An X-ray has a wavelength of 0.01 A. Its momentum is

a) 3.313 X 10^{-22} kg-m/sec b) 6.626 X 10^{-22} kg-m/sec

c) 3.456 X 10⁻²⁵ kg-m/sec d) 2.126 X 10⁻²² kg-m/sec

58. Bragg's equation will not have solution, if

a) $\lambda > 2d$ b) $\lambda < 2d$ c) $\lambda > d$ d) $\lambda = d$

59. The de Broglie wavelength (λ) of a particle of mass *m* and charge *e*, accelerated by a potential V is given by

a)
$$\sqrt{2hmVe}$$
 b) $\frac{h}{\sqrt{2mVe}}$ c) $h\sqrt{2mVe}$ d) $\frac{\sqrt{2mV}}{eh}$

60. An α – particle and a proton have the same kinetic energy. The ratio of their wavelengths is (m $_{\alpha}$ = 4mp)

a) 1:2 b) 2:1 c) 1:4 d) 4:1

61. If ΔX and ΔP are uncertainties in the measurement of position and momentum respectively, then according to Heisenberg uncertainty principle

a) $\Delta X \Delta P \ge \hbar$ b) $\Delta X \Delta P \le \hbar$ c) $\Delta X \Delta P > \hbar^2$ d) $\Delta X \Delta P < \hbar^2$

62. A spaceship 50 m long was to pass the earth travelling at 2.5×10^8 m/sec. Assuming a Lortenz-Fitzgerlad contraction, its apparent length will be a) 3 m b) 30 m c) 300 m d) 0.3 m

63. A nucleus of	atomic mass A and	atomic number Z e	mits a β particle.		
The atomic mas	s and atomic numb	er of the resulting n	ucleus are		
a) A, Z	b) A+1,Z	c) A,Z +1	d) A-4,Z-2		
64. The phenome	non of nuclear fissi	ion to a certain exte	nt can be easily		
explained by					
a) liquid drop m	nodel	b) shell model			
c) collective mo	odel	d) central force	d) central force field model		
65. Tungsten is e	xtensively used for	thermionic filamen	t because		
a) its work func	tion is the smallest				
b) it has a very	high melting point				
c) it has low der	nsity				
d) it acts like a l	black body for filan	nent radiation			
66. Atomic power station at Tarapur has a generating capacity of 200 MW.					
The energy generated in a day by this station is					
a) 200 MW b) 200 Joules					
c) 4800 X 10 ⁶ Joules d) 1728 X 10 ¹⁰ Joules					
67. If r denotes the mean distance of a planet from the sun and T the time					
period of the planet, then					
a) $r \propto T^{2/3}$	b) $r \propto T^{3/2}$	c) $r \propto T^{1/3}$	d) $r \propto T$		
68. Fermi energy is					
a) the minimum energy possessed by an electron at 0 K					
b) the maximum energy possessed by an electron at 273 K					

- c) the maximum energy possessed by an electron at 0 K
- d) the minimum energy possessed by an electron at 273 ${\rm K}$

69. The term trans	sistor stands for			
a) transfer of res	istance, i.e., the change	e of resistance		
b) transfer of vo	ltage			
c) transfer of power		d) transfer of cu	d) transfer of current	
70. The planet ha	ving no atmosphere on	it is		
a) earth	b) venus	c) mars	d) mercury	
71. The three axes	s of a crystal lattice are	mutually perpen	dicular and two of	
the lattice param	neters are equal. The cr	ystal system is		
a) tetragonal	b) trigonal	c) rhombohedra	l d) cubic	
72. The circuit us	ed for parallel to serial	conversion of da	ta is called	
a) multivibrator	b) multiplexer	c) demultiplexer	d) amplifier	
73. Stars radiate l	ight of their own becau	ise of		
a) fission reaction	ons	b) chemical read	ctions	
c) mechanical contractions		d) fusion reactions		
74. The binary co	de of $(21.25)_{10}$ is			
a) 10100.001	b) 10101.001	c)10101.010	d) 10100.100	
75. A half adder can be constructed from				
a) one XOR gate	e and one AND gate			
b) one XOR gate	e and one OR gate with	n their inputs com	nected in parallel	
c) two XOR gate	es only			
d) one XOR and	one OR gate with their	r outputs connect	ted in parallel	





College with Potential for Excellence

Residential & Autonomous – A Gurukula Institute of Life-Training Re-accredited (3rd Cycle) with 'A' Grade (CGPA 3.59 out of 4.00) by NAAC [Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2021 Part – IV: Skill Based Subject: Sixth Semester: Paper – III

MEDICAL INSTRUMENTATION

Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

<u>SECTION – A</u>

Answer ALL Questions $(10 \times 1 = 10)$ 1. ______ is the measure of the reproducibility of the measurements a) Precision b) Simplicity c) Stability d) Hysteresis 2. is called cardiac pacemaker. a) Sino Atrial node b) Atrio-Ventricular node d) Purkinje fibres c) The bundle of HIS 3. The device used to convert one form of signal to electrical signal is d) Transducer a) ECG b) EEG c) Transformer 4. Study of electrical activity of heart muscles is a) EEG b) ECG c) PET d) MRI 5. The outer layer of the brain is called _____ b) skull a) cerebrum c) cerebral cortex d) cerebellum 6. On the surface of the brain, the voltage is about _____ mV a) 5 b) 10 c) 15 d) 100 7. Servo Controlled Ventilators work in _____ mode a) Assisted b) Assisted-control c) Controlled d) Pressure control

8	is used to measur	e the volume of e	xhaled air.
a) Spirometer	b) Humidifier	c) Nebulizer	d) Ventilator
9. 80 % of our bo	ody atoms are of		
a) Nitrogen	b) Oxygen	c) Hydrogen	d) Carbon
10. Waves used i	in MRI is		
a) Microwaves	b) Infrared	c) Radio waves	d) X-rays
	SECTIO	<u> </u>	
Answer any Fl	VE Questions		$(5 \times 2 = 10)$
11. Define linear	ity.		
12. What is the a	mplitude of QRS com	plex in ECG wave	?
13. What is calle	d evoked potential?		

- 14. What do you mean by REM sleep?
- 15. What is the frequency of Alpha waves?
- 16. Write down the combination used in anesthetic Nitrous oxide
- 17. Give any two advantages of Laser surgery.

<u>SECTION – C</u>

Answer ALL Questions

 $(3 \times 9 = 27)$

18. a) Draw the block diagram of Bio-Medical instrument system.

[OR]

b) Explain about Bipolar Limb leads.

19. a) Illustrate brain waves on the basis of frequency.

[OR]

b) Explain various electro surgery techniques used in diathermy unit.

20. a) With neat diagrams explain about Rotameter and Turbine flowmeter.

[**OR**]

b) Illustrate Positron Emission Tomography.

$\underline{SECTION-D}$

<u>Answer any TWO Questions</u> (2 × 14 = 28) 21. Explain about Augmented unipolar Limb leads system used in ECG. 22. Draw the block diagram of ECG recording setup and explain. 23. Describe the working of anaesthesia machine with neat diagram.

24. Explain MRI system with neat block diagram.

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST



College with Potential for Excellence Residential & Autonomous – A Gurukula Institute of Life-Training Re-accredited (3rd Cycle) with 'A' Grade (CGPA 3.59 out of 4.00) by NAAC [Affiliated to Madurai Kamaraj University]

B.A. & B.Sc. Degree (Semester) Examinations, April 2021 Part – IV: Non-Major Elective Subject: Second Semester: Paper – I CIVIL DEFENCE AND ADVENTURE TRAINING

/IL DEFENCE AND ADVENTURE TRAININ Under CBCS – Credit 2

Time: 2 Hours

Max. Marks: 75

<u>SECTION – A</u>

Answer ALL	$(10 \times 1 = 10)$				
1. The strength	of the Guard of Hor	nour for Prime m	ninister is		
a) 100	b) 150	c) 50	d) 125		
2. The word of	command thaine mu	r is meaning of			
a) right turn	b) stand at ease	c) left turns	d) Stand easy		
3. Sequence of	fire control order is				
a) GRIT	b) RITG	c) ITGR	d) FCO		
4. In MR, yello	ow color represents				
a) Reserved forest		b) Cultivated	b) Cultivated area		
c) living area		d) dry river			
5. Cadets one b	behind another is call	led			
a) file	b) Rank	c) blank file	d) None of these		
6. Caliber size	of 0.22" rifle is				
a) 0.22"	b) 7.62 mm	c) 0.33"	d) 2 cm		
7. In aadha dha	aine mur the squad tu	ırns degre	e right.		
a) 45 °	b) 100°	c) 120°	d) 90°		

8. For NCC training, the obstacle course consist of

a) 10 obstacle	b) 12 obstacle
c) 15 obstacle	d) 5 obstacle
9. self- help measures adopte	d by civilian population are called
a) self defence	b) civil defence
c) Rescue service	d) salvage service
10. Two or more persons share	re some idea or information via some
media is called	
a) communication	b) transmission
c) receiver	d) Transreceiver

<u>SECTION – C</u>

Answer ALL Questions

 $(3 \times 9 = 27)$

18. a) Write the five aims of Drill

[OR]

b) Explain the functions of Civil defence.

19. a) Explain how to set a map to ground.

[**OR**]

b) Describe the methods of judging distance.

20. a) What are the types of adventure training?

[OR]

b) Write the ten parts of the liquid prismatic compass.

<u>SECTION – B</u>

Answer any FIVE Questions	$(5 \times 2 = 10)$	<u>SECTION – D</u>	
11. What is civil defence?		Answer any TWO Questions	$(2 \times 14 - 28)$
12. Write the parts of word of command.		21. Explain the safety measures for cycle expedition	n to NCC cadets.
13. What are the types of north?		22. Describe the different section formation drill.	
14. What is communication?		23. Explain the different methods of communicatio	n.
15. Expand the term RTE and NGO.		24. Write down the parts of 7.62mm SL rifle with r	neat diagram.
16. Write the uses of service protector.			
17. Define the term "line tor".		2 2 2 2 2	