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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
DBT - Star College Scheme Funded
[Affiliated to Madurai Kamaraj University]
B.Sc. Maths/Chem. Degree (Semester) Examinations, April 2023
Part – III: Ability Enhancement Course: Second Semester: Paper – I
ALLIED PHYSICS-II
Under CBCS and LOCF – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. The points in the consecutive slits separated by the distance is

   a) a / b   b) a× b   c) a + b   d) a - b

2. In an _____ pattern, all the maxima are of same intensity

   a) polarization   b) refraction   c) interference   d) diffraction

3. The magentic quantum number (m) refers to

   a) Sublevel or shape of the orbital the electron is in

   b) direction of electron spin

   c) Energy level the electron is in

   d) orientation of orbital's around nucleus

4. The electronic configuration of the alkali metals Li (Z=3)

   a) $1S^2 2S^1$ b) $1S^1 2S^2$ c) $1S^1 2S^1$ d) $1S^2 2S^2$

5. The ionization chamber contains some gas like sulphur dioxide or
   a) oxygen   b) methyl bromide
   c) nitrogen   d) chlorine

6. For the fusion to take place, the component nuclei must be brought to

   within a distance of

   a) 10^{-10} cm   b) 10^{-2} cm   c) 10^{-11} cm   d) 10^{-12} cm

7. What two principles make up the theory of special relativity?

a) Principle of nuclear forces and the principle of the speed of light

b) Principle of relativity and the principle of mass

c) Principle of mass and the principle of nuclear forces

d) Principle of relativity and the principle of the speed of light

8. If 4kg of a substance is fully converted into energy, how much energy is produced?

a) 3.6×10^{17} J   b) 2.6×10^{17} J   c) 3.6×10^{10} J   d) 3.6×10^{-17} J

9. The basic logic gate whose output is the complement of the input is the

a) AND   b) OR   c) Inverter   d) comparator

10. The only function of NOT gate is to _____.

a) stop a signal   b) invert input signal

c) act as a universal gate   d) none of the above

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. What is called a diffraction grating?

12. What do you mean by spatial quantization?

13. What is Stoke's Law?

14. State Pauli exclusion principle.

15. Define binding energy.

16. State the basic postulates of the special theory of relativity.

17. State Demorgan's second theorem.

SECTION – C

Answer ALL Questions   **(5 × 5 = 25)**

18. a) What is diffraction? Differentiate between Fresnel and Fraunhofer diffraction.

[OR]

b) A parallel beam of sodium light (λ=589 X 10^{-9} m) is incident on a thin glass plate (n=1.5) such that the angle of refraction into the plate is 60°.Calculate the Smallest thickness of the plate which will make it appear dark by reflection.

19. a) Discuss orbital, spin quantum number, and total angular momentum quantum numbers.

[OR]

b) The Experimental value of Bohr magneton is 9.21 X 10^{-24} SI Units and Planck's Constant h=6.6 X10^{-34} joule-second. Calculate the Value of e/m of electron.

20. a) Explain how the mass defect method is able to explain the relationship between fission energy and mass.

[OR]

b) α-particles of energy 5 MeV pass through on a ionization chamber at the rate of 10 per second. Assuming all the energy is used in producing ion pairs, calculate the current produce (35 eV is required for producing an ion pair and e=1.6 X 10^{-19} C).

21. a) Deduce Galilean transformation equations.

[OR]

b) A particle with a proper lifetime of 1 micro seconds through the laboratory at $2.7 * 10^8$ ms^{-1}. a) what is its lifetime, as measured by observers in the laboratory? What will be the distance traversed by it before disintegrating?

22. a) Analyse the characteristics of the Zener diode.

[OR]

b) Prove that i) $(A+B)(A+C) = A+BC$ ii) $AC+ABC = AC$

SECTION – D

Answer any THREE Questions   **(3 × 10 = 30)**

23. Determine the specific rotatory power of sugar solution using Lauret's Half shade polarimeter.

24. Classify the various types of quantum number associated with the vector atom model.

25. Describe the stern & Gerlach experiment and indicate at the important of the results obtained.

26. Deduce Lorentz transformation equation using these equations explain length contraction.

27. Prove NAND & NOR gate as a universal gate.

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B.Sc. Physics Degree (Semester) Examinations, April 2023
Part – III: Core Course: Second Semester: Paper – I
THERMODYNAMICS AND STATISTICAL MECHANICS
Under CBCS and LOCF – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. The heat is absorbed by

   a) condenser   b) evaporator   c) compressor   d) thermostat

2. 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. Value of Van der Waals constant 'a' increases with increase in

   a) pressure   b) volume

   c) intermolecular forces   d) temperature

4. Which of the following is relevant for real gases, but irrelevant for ideal

   gases?

   I. Volume of gas particles

   II. Intermolecular forces between gas particles

   III. Volume of container

   a) I only   b) III only   c) I and III   d) I and II

5. Out of the following, the physical quantity that relates with first law of thermodynamics is
   a) temperature
   b) pressure
   c) internal energy
   d) number of moles

6. An adiabatic process occurs at constant
   a) temperature
   b) pressure
   c) heat
   d) volume

7. The value of probability of an event cannot be
   a) zero
   b) 1
   c) ½
   d) negative

8. The particles obeying Maxwell-Boltzmann statistics are
   a) identical
   b) identical and indistinguishable
   c) distinguishable
   d) photons

9. Deduction of Planck's law is possible on the basis of
   a) Fermi-Dirac (FD) Statistics
   b) classical statistics
   c) Maxwell-Boltzmann (MB) Statistics
   d) Bose-Einstein (BE) Statistics

10. When applied to solar radiation, Planck's law reduces to Wien's law in the_____
   a) ultraviolet region
   b) microwave region
   c) infrared region
   d) visible region

SECTION – B

Answer any FIVE Questions $(5 \times 2 = 10)$

11. State Weidmann – Franz law.

12. Define critical temperature.

13. Differentiate between open and isolated system.

14. What is a phase space?

15. State any two basic postulates of Bose – Einstein statistics.

16. Define coefficient of thermal conductivity.

17. State the first law of thermodynamics.

SECTION – C

Answer ALL Questions $(5 \times 5 = 25)$

18. a) Derive Newton's law of cooling from Stefan's law.

[OR]

b) The opposite faces of a metal plate of 0.2 cm thickness are at a difference of temperature of 100°C and the area of the plate is 200 sq.cm. Find the quantity of heat that will flow through the plate in one minute if K = 0.2 CGS units.

19. a) Describe Linde's process for liquefaction of air.

[OR]

b) Calculate critical temperature for CO_2 given that a = 0.00874 atmos.cm^6 and b = 0.0023 cm^3.

20. a) Calculate the work done during an adiabatic process.

[OR]

b) A Carnot's engine whose temperature of the source is 400 K take 200 calories of heat at this temperature and rejects 150 calories of heat to the sink. What is the temperature of the sink? Also calculate the efficiency of the engine.

21. a) Explain about the theorem of equipartition of energy.

[OR]

b) The first excited state of hydrogen atom is 10.2 eV above its ground state. What temperature is needed to excite hydrogen atoms to the first excited level?

22. a) Explain the significance of Fermi energy.

[OR]

b) Three particles are to be distributed in four energy levels a, b, c and d. Calculate all possible ways of this distribution when particles are

i) Fermions   ii) Bosons &   iii) Classical particles.

SECTION – D

Answer any THREE Questions $(3 \times 10 = 30)$

23. Discuss in detail about Forbes method for finding the coefficient of thermal conductivity of a metal bar.

24. Explain Joule – Thomson porous plug experiment with neat diagram. Discuss the experimental results.

25. Calculate the work done in Carnot's cycle of operations. Deduce the efficiency of Carnot's engine in terms of the temperatures between which it works.

26. Obtain Maxwell – Boltzmann distribution law for speeds of molecules of a perfect gas using Maxwell – Boltzmann energy distribution law.

27. Compare M-B, F-D and B-E statistics.

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B.Sc. Physics Degree (Semester) Examinations, April 2023
Part – III: Core Course: Second Semester: Paper – II
OPTICS AND SOUND
Under CBCS and LOCF – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions $(10 \times 1 = 10)$

1. A device that can be used to measure change in length with great accuracy by means of interference fringes.

a) Polarimeter   b) Interferometer   c) microscope   d) spectrometer

2. The similarity between the sound waves and light waves is

a) both are electromagnetic waves

b) both are longitudinal waves

c) both have same speed in a medium

d) they can produce interference

3. A photograph of an interference pattern in three dimensional images is called _____

a) pixel   b) Hologram   c) holography   d) bar code

4. Which property of light is confirmed by diffraction?

a) Particle nature   b) Transverse wave nature

c) Longitudinal wave nature   d) Wave nature

5. If plane polarized light with its vibrations making an angle of 45º with the optic axis, passed through a quarter wave plate, the emergent light is ____

a) Linearly polarized   b) plane polarized

c) circularly polarized   d) elliptically polarized

6. Brewster's angle is when
   a) reflected light is completely polarised light
   b) reflected light is partially polarised
   c) no light is reflected
   d) angle between incident and reflected light is 90 degrees

7. In simple harmonic motion the average kinetic energy during one period is exactly equal to _____
   a) average potential energy   b) average kinetic energy
   c) average pressure energy   d) none of the above

8. In damped harmonic oscillation which one decreases?
   a) amplitude of vibration   b) energy of vibration
   c) both amplitude and energy   d) neither amplitude nor energy

9. In fluids, sound waves are _____
   a) Longitudinal   b) transverse   c) resonance   d) frequency

10. Sound and light waves both
    a) have similar wavelength   b) obey the laws of reflection
    c) travel as longitudinal waves   d) travel through vacuum

SECTION – B

Answer any FIVE Questions $(5 \times 2 = 10)$

11. Define the term coherence.

12. What is an interferometer?

13. Define resolving power of the grating.

14. State Bragg's law.

15. What is optical activity?

16. Write down some applications of simple harmonic motion.

17. Differentiate compressions and rarefactions in sound waves.

SECTION – C

Answer ALL Questions $(5 \times 5 = 25)$

18. a) Derive the relation for intensity in double slit interference.

[OR]

b) For a triangular prism of glass, a ray incident normal to one faces being totally reflected. If θ_1 is 45°, conclude about the index of refraction n of the glass.

19. a) Discuss about diffraction at a circular aperture.

[OR]

b) A certain grating has 10^4 slits with a spacing of d = 2.1 μm = 2100 nm. It is illuminated with yellow sodium light (λ = 589 nm).

Find a) the angular position of all principal maxima observed and

b) the angular width of the largest order maximum.

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

[OR]

b) A quartz quarter wave plate is to be used with sodium light (λ = 589 nm). What is the minimum thickness of such a plate?

21. a) Derive the period of oscillations of a torsional oscillator.

[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 s. Find the value of g, the acceleration due to gravity at that location.

22. a) How do you calculate the power and intensity of sound waves in fluids?

[OR]

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

SECTION – D

Answer any THREE Questions   **(3 × 10 = 30)**

23. Explain the working principle of Michelson interferometer. Also how to measure the changes in the length by means of interference fringes.

24. Explain the production of X-rays and the use of X-ray diffraction in sodium chloride structure analysis.

25. Explain the following phenomenas:

    i) Polarization by reflection

    ii) Double refraction

26. Solve the equation of motion of simple harmonic oscillator.

27. What happens when a sound wave gets reflected and travels back in the opposite direction.

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Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. The knee voltage of a crystal diode is approximately equal to_____

a) applied voltage   b) breakdown voltage

c) forward voltage   d) barrier potential

2. The _____filter circuit results in the best voltage regulation.

a) choke input   b) capacitor input

c) resistance input   d) d.c input

3. A transistor is a _____ operated device.

a) Current   b) Voltage

c) Both voltage and current   d) linear

4. A JEFT is also called _____ Transistor.

a) unipolar   b) bipolar   c) unijunction   d) tripolar

5. The base resistor method is generally used in_____

a) amplifier circuits   b) switching circuits

c) rectifier circuits   d) regulator circuits

6. The noise factor of an ideal amplifier expressed in *db* is_____

a) 0   b) 1   c) 0.1   d) 10

7. An oscillator differ from an amplifier because it_____
a) has more gain   b) requires no input signal
c) requires no d.c. supply   d) always has the same input

8. First integrated circuit chip was developed by
a) C.V.Raman   b) W.H.Brattain
c) J.S.Kilby   d) Robert Noyce

9. Over modulation (amplitude) occurs when signal amplitude is
_____carrier amplitude
a) equal to   b) greater than   c) less than   d) not equal to the

10. The major advantage of FM over AM is_____
a) reception is less noisy   b) higher carrier frequency
c) smaller bandwidth   d) small frequency deviation

SECTION – B

Answer any FIVE Questions $(5 \times 2 = 10)$

11. What is a transistor? Why is it so called?

12. Name the three possible transistor connections? Draw the symbol of npn and pnp transistor and specify the leads.

13. Define the JFET parameters.

14. Mention the essentials of biasing circuits.

15. What is an oscillator? What is its need?

16. Define modulation.

17. What is ripple factor?

SECTION – C

Answer ALL Questions $(5 \times 5 = 25)$

18. a) Obtain an expression for the efficiency of half wave rectifier.

[OR]

b) What is Zener diode? Explain the working of Zener diode as a voltage regulator.

19. a) Differentiate JFET and Bipolar Transistor.

[OR]

b) A JFET has a drain current of 5 mA. If $I_{DSS} = 10mA$ and $V_{GS(OFF)} = -6V$, find the value of   i) Vgs   ii) Vp

20. a) What are the salient features of voltage divider bias?

[OR]

b) In a Transistor amplifier when the signal changes by 0.02V, the base current changes by 10 μ A and collector current by 1mA. If collector load $Rc = 5k\Omega$ and $R_L = 10k\Omega$. find   i) current gain
ii) input impedance   iii) a.c. load   iv) voltage gain   v) power gain.

21. a) A 1pF capacitor is available. Choose the inductor values in a Hartley oscillator so that f = 1 M H_Z and $m_v = 0.2$.

[OR]

b) List out the characteristic of an ideal OP-AMP and mention its applications.

22. a) Compare Amplitude, Frequency and Phase Modulation.

[OR]

b) Explain working of Quartz crystal.

SECTION – D

Answer any THREE Questions   **(3 × 10 = 30)**

23. Give the expression for efficiency of a full wave bridge rectifier.

24. Explain the working of FET and draw the output characteristics? What is a DC load line? Give its importance.

25. Discuss in detail about the RC coupled transistor amplifier with a neat circuit diagram.

26. Describe the construction of Hartley oscillator and explain its working.

27. Explain AM radio receivers and its types and also explain Radio receiver circuit.

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SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. Order of convergence of Newton Raphson method is
   a) 1   b) 2   c) 2.5   d) 1.8

2. One root of the equation $3x - \log_{10}^{x} = 6$ lies between

   a) 0 *and* 1   b) 1 *and* 2   c) 2 *and* 3   d) 3 *and* 4

3. The modification of Gauss elimination method is Gauss _____ method.
   a) Elimination   b) Jacobi   c) Jordan   d) Seidal

4. A square matrix $[A]_{nxn}$ is diagonally dominant if

   a) $|a_{ii}| \geq \sum_{\substack{j=1 \\ i \neq j}}^{n} |a_{ij}|, i = 1, 2, \ldots,$ b) $|a_{ii}| \geq \sum_{\substack{j=1 \\ i \neq j}}^{n} |a_{ij}|, i = 1, 2, \ldots, n$ and

   $|a_{ii}| > \sum_{\substack{j=1 \\ i \neq j}}^{n} |a_{ij}|,$ for any $i = 1, 2, \ldots, n$

   c) $|a_{ii}| \geq \sum_{j=1}^{n} |a_{ij}|, i = 1, 2, \ldots, n$ and $|a_{ii}| > \sum_{j=1}^{n} |a_{ij}|,$ for any $i = 1, 2, \ldots, n$

   d) $|a_{ii}| \geq \sum_{j=1}^{n} |a_{ij}|, i = 1, 2, \ldots, n$

5. _____ formula is the average of Gauss forward and Gauss

backward interpolation formula.

   a) Weddle's   b) Stirling's   c) Trapezoidal   d) Bessel's

6. Polynomials are the most commonly used functions for interpolation because they are easy to

a) evaluate   b) differentiate

c) integrate   d) evaluate, differentiate and integrate

7. The error is Simpson's $\frac{1}{3}$ rule is of order _____.

   a) h^2 b) h^3 c) h^4 d) h

8. $\frac{1}{h^2}\left[\Delta^2 y_0 - \Delta^3 y_0 + \frac{11}{12}\Delta^4 y_0 - - - - - - -\right] = $ _____.

   a) $\left(\dfrac{dy}{dx}\right)_{x=x_0}$ b) $\left(\dfrac{d^2 y}{dx^2}\right)_{x=x_0}$ c) $\dfrac{dy}{dx}$ d) 1

9. A partial differential equation requires

a) exactly one independent variable

b) two or more independent variables

c) more than one dependent variable

d) equal number of dependent and independent variables

10. The velocity (m/s) of a body is given as a function of time (seconds) by

$$v(t) = 200\ln(1+t) - t, \ t \geq 0$$

Using Euler's method with a step size of 5 seconds, the distance in meters traveled by the body from t = 2 to t = 12 seconds is most nearly

a) 3133. 1   b) 3939.7   c) 5638   d) 39.39

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. Give an example for transcendental equation.

12. Write down the iterative formula of Newton-Raphson method.

13. What are the two numerical methods used in solving simultaneous linear algebraic equations?

14. When does the iterative method succeed in solving all systems of equations?

15. For performing interpolation of given data, when do we use Newton's forward and backward difference formula?

16. State the nature of y(x) and the number of intervals in the case of Simpson's one-third rule.

17. What is a truncation error?

SECTION – C

Answer ALL Questions   **(5 × 5 = 25)**

18. a) Find the real root of equation $\cos x = 3x - 1$ correct to 4 decimal places by iteration method.

[OR]

b) Find the positive root of $xe^x = 2$ by the method of false position.

19. a) Solve by Gauss-Elimination method

$$3.15x - 1.96y + 3.85z = 12.95$$
$$2.13x + 5.12y - 2.89z = -8.61$$
$$5.92x - 3.05y + 2.15z = 6.88$$

[OR]

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

$$28x + 4y - z = 32$$
$$x + 3y + 10z = 24$$
$$2x + 17y + 4z = 35$$

20. a) The following data are taken from steam table

Temp °C	140	150	160	170	180
Pressure kgf/cm²	3.685	4.854	6.302	8.076	10.225

Find the pressure at temperature t =142°C and t = 175° C.

[OR]

b) If
$$\sqrt{12500} = 111.803399, \quad \sqrt{12510} = 111.848111,$$
$$\sqrt{12520} = 111.892805, \quad \sqrt{12530} = 111.937483$$

Find $\sqrt{12516}$ by Guass's backward formula.

21. a) A rod is rotating in a plane. The following table gives an angle 'θ' (in radians) through which the rod turned for various values of time t (seconds). Calculate the angular velocity and angular acceleration of the rod at 0.6 seconds.

t :	0	0.2	0.4	0.6	0.8	1.0
θ :	0	0.12	0.49	1.12	2.02	3.20

[OR]

b) Evaluate $I = \int_{0}^{6} dx/(1+x)$ using i) trapezoidal rule ii) Simpson's rule

22. a) By means of Taylor series expansion, find y at x=0.1,0.2 correct to three significant   digits given $\dfrac{dy}{dx} - 2y = 3e^x$, $y(0) = 0$

[OR]

b) Using Runge-Kutta method of fourth order

solve $\dfrac{dy}{dx} = (y^2 - x^2)/(y^2 + x^2)$ Given y(0)=1 at x=0.2,0.4.

<u>SECTION – D</u>

<u>**Answer any THREE Questions**</u>   **(3 × 10 = 30)**

23. Find the positive root of $x^3 = 2x + 5$ by the False Position method.

24. Solve by Gauss-Elimination method

$$10x + y + z = 12$$
$$2x + 10y + z = 13$$
$$x + y + 5z = 7$$

25. From the following table, find the value of tan 45°15'

x°	45	46	47	48	49	50
tan x°	1.00000	1.03553	1.07237	1.11061	1.05037	1.19175

26. Derive Newton's forward difference formula to get the derivative.

27. Apply the fourth-order Runge-Kutta method to find y(0,2) Given that y'= x+y, y(0)=1.

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B.Sc. Physics Degree (Semester) Examinations, April 2023
Part – III: Core Course: Sixth Semester: Paper – I
NUCLEAR PHYSICS
Under CBCS and LOCF – Credit 4

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. One barn is

   a) 10^{-28} m^2 b) 10^{-30} m^2 c) 10^{-24} m^2 d) 10^{-20} m^2

2. Which chamber has led to the discovery of many elementary particles like

   positron, meson, etc.?

   a) Wilson cloud chamber   b) Ionisation chamber

   c) Geiger – Muller counter   d) Proportional Counter

3. The Geiger-Nuttal law is

   a) $\log \lambda = A + B \log C$ b) $\log \lambda = A + B \log R$

   c) $\log \lambda = A - B \log R$ d) $\log \lambda = A + B \log M$

4. The decay constant λ is equal to the ratio of the atoms disintegrating per

   unit time to the total number of

   a) protons   b) electrons   c) neutrons   d) atoms

5. Artificially radioactive elements are now being produced by placing the

   elements is

   a) atom bomb   b) nuclear reactors

   c) hydrogen bomb   d) moderators

6. Thermal neutrons from nuclear reactors have de-Broglie wavelengths of

the order of

a) 18.2 nm   b) 1.82 mm   c) 18.2 A°   d) 1.82 A°

7. What type of reaction takes place in sun?

a) spontaneous fission   b) nuclear fission

c) nuclear fusion   d) double beta decay

8. Which of the following materials used to make control rods?

a) Cesium   b) Gallium   c) Tin   d) Cadmium

9. The charge of the particle *dds* is

a) e   b) –e   c) (1/3) e   d) - (1/3) e

10. If the average density of the Universe were greater than the critical

density, the Universe would

a) continue to expand forever   b) continue to contract forever

c) eventually stop contracting and begin expansion

d) eventually stop expanding and then contract

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. Define isobars.

12. What is the meaning of "end point energy"?

13. Define a compound nucleus.

14. What is meant by 'critical mass'?

15. Describe hadrons.

16. Define the packing fraction.

17. What is natural radioactivity?

SECTION – C

Answer ALL Questions   **(5 × 5 = 25)**

18. a) Describe the ionization chamber.

[OR]

b) b) Calculate the binding energy of an alpha particle and express the results both in MeV and joules.

19. a) Determine the wavelength of gamma rays.

[OR]

b) A self-quenched G-M counter operates at 1000 volts and has a wire diameter of 0.2 mm. The radius of the cathode is 2 cm and the tube have a guaranteed life time of 10^9 counts. What is the maximum radial field and how long will the counter last if it is used on an average for 30 hours per week at 3000 counts per minute? Consider 50 weeks to a year.

20. a) What are the sources of neutron?

[OR]

b) In the photodisintegration equation for the deuteron the threshold energy is 3.227 MeV, $\gamma(h^\gamma) + {}_1H^2 \rightarrow {}_1H^1 + {}_0n^1$ -2.227 MeV.

The mass difference between the doublet $2({}_1H^1)$ and D $({}_1H^2)$ is $1.5380*10^{-3}$ u. If the mass of hydrogen atom is 1.007825 u, calculate the mass of the neutron.

21. a) Describe nuclear fusion reactions and also find the fusion energy of the helium nucleus formed by the fusion of two deuterium nuclei.

[OR]

b) Find the energy released by fission of 1 kg of U^{253}.

22. a) Give a short account of the fundamental interactions between the elementary particles.

[OR]

b) Find the compositions of some hadrons according to the Quark Model.

SECTION – D

Answer any THREE Questions   **(3 × 10 = 30)**

23. Use the liquid drop model theory to obtain semi empirical mass formula and write its merits.

24. How will you measure the range of alpha particles?

25. Classify the applications of radio isotopes.

26. Differentiate power reactor and pressurized water reactor.

27. Analyse the future of the universe.

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DBT - Star College Scheme Funded
[Affiliated to Madurai Kamaraj University]
B.Sc. Physics Degree (Semester) Examinations, April 2023
Part – III: Elective Course: sixth Semester: Paper – I
QUANTUM MECHANICS & RELATIVITY
Under CBCS and LOCF – Credit 5

Time: **3** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. Lenard's Experiment clearly shows that photo particles are _____

   a) Electrons   b) neutrons   c) Protons   d) none of these

2. The wavelength of a photon is related to its momentum by $\lambda =$ _____

   a) hp   b) h / p   c) p / h   d) ph^2

3. The de-Broglie hypothesis is associated with _____

   a) Wave nature of electrons only   b) Wave nature of α-particles only

   c) Wave nature of radiations

   d) Wave nature of all material particles

4. Heisenberg Uncertainty principle is given by

   a) $\Delta x \Delta p = h/2\pi$ b) $\Delta x \Delta p = h/4\pi$ c) $\Delta x \Delta p \geq h/4\pi$ d) $\Delta x \Delta p \geq h/2\pi$

5. The expression for the lowest energy state for the electron of the hydrogen atom

   a) $E_1 = -\dfrac{me^4}{8\varepsilon_0^2 h^2}$ b) $E_1 = -\dfrac{me^2}{8\varepsilon_0^3 h^2}$ c) $E_1 = -\dfrac{me}{8h\varepsilon_0^2}$ d) $E_1 = \dfrac{me^4}{8\varepsilon_0^2 h^2}$

6. Kinetic energy in terms of momentum is given by KE = _____

   a) p / 2m   b) p^2/ 2m   c) p / m   d) p / m^2

7. The wave functions associated with a material particle is_____.

   a) Only finite   b) Only continuous

   c) Only single valued   d) Finite continuous and single valued

8. For n=3, the degenerate eigen function of hydrogen atom are _____

   a) 9   b) 18   c) 10   d) 20

9. Special theory of relativity treats problems involving

   a) inertial frame of reference

   b) non-inertial frame of reference

   c) non-accelerated frame of reference

   d) accelerated frame of reference

10. Formula for length contraction is $l =$___ _____

   a) $l_0(1-v^2/c^2)^{-1/2}$ b) $l_0(1-v^2/c^2)^{1/2}$

   c) $l_0(1-c^2/v^2)^{-1/2}$ d) $l_0(1-c^2/v^2)^{1/2}$

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. Define threshold frequency.

12. What are photo-electric cells?

13. State Heisenberg's uncertainty principle.

14. Define Eigen value and Eigen functions.

15. How do you calculate reflectance and transmittance?

16. State superposition principle in quantum mechanics.

17. State Newtonian principle of relativity.

SECTION – C

Answer ALL Questions   **(5 × 5 = 25)**

18. a) Describe the construction and working of a photo emissive cell.

[OR]

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

19. a) Prove the wave nature of electron using a double slit experiment.

[OR]

   b) Show that the de Broglie wavelength associated with an electron of energy V electron - volt is approximately $(1.227 / \sqrt{v})nm$.

20. a) Explain tunnel effect with transmission probability.

[OR]

   b) Calculate the expectation value $\langle p_x \rangle$ of the momentum of a particle trapped in a one- dimensional box.

21. a) Calculate the momentum of a free particle.

[OR]

   b) An Eigen function of an operator $\dfrac{d^2}{dx^2}$ is $y = e^{2x}$. Find the corresponding Eigen value.

22. a) Explain the concept of length contraction.

<div align="center">

[OR]

</div>

b) A clock in space ship emits signals at intervals of 1 second as observed by an astronaut in the spaceship. If the spaceship travels with the speed of 3×10^7, what is the interval between successive signals as seen by an observer at the control centre on the ground.

<div align="center">

SECTION – D

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Answer any THREE Questions   **(3 × 10 = 30)**

23. Explain Richardson and Compton's experiment to study photoelectric phenomena.

24. Explain G.P.Thomson's experiment on electron diffraction.

25. What is a potential step? Find the amplitude of the reflected and transmitted beam in terms of the incident wave.

26. Derive orbital angular momentum operator.

27. Describe the Michelson-Morley experiment.

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B.A. & B.Sc. Degree (Semester) Examinations, April 2023
Part–IV: Generic Elective Course: Second Semester: Paper – I
ELECTRICAL HOME APPLIANCES
Under CBCS and LOCF – Credit 2

Time: **2** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. The frequency of AC supply is

    a) 0 Hz   b) 40 Hz   c) 50 Hz   d) 70 Hz

2. The flow of electrons are

    a) light   b) current   c) sound   d) frequency

3. The term DC stands for

    a) Direct current   b) Distribution count

    c) Direct chart   d) Direct couple

4. According to voltage, the transformer are _____types

    a) three   b) four   c) two   d) five

5. In electrical lamp, electrical energy converted into

    a) chemical energy   b) sound energy

    c) heat energy   d) light energy

6. The term LED means

    a) light emitting diode   b) low emitting diode

    c) light evolve display   d) all the above

7. The normal human body temperature is

a) 36.9°C   b) 41.9°   c) 98.4°C   d) 20.0°C

8. An electric heater is a device is used to heat

a) water   b) vegetables   c) blood   d) air

9. The wattage amount of mixi is

a) 500 watts   b) 250 watts   c) 100 watts   d) 1000 watts

10. The base of the electric iron box is made up of

a) copper   b) aluminum   c) nichrome   d) brass

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. State Omh' law

12. What do you mean by single phase?

13. Define current

14. Define the term choke

15. Write a short note on electric heater

16. Write down the number 7 in LED format.

17. Give any two applications of fan regulators

SECTION – C

Answer ALL Questions   **(3 × 9= 27)**

18. a) Explain about the two phase and three phase suppy.

[OR]

b) Diffence between alternating current and direct current

19. a) Discuss about the working principle of sodium vapour lamp.

[OR]

b) Explain the phenomenon of seven segment display.

20. a) Comparison of fluorescent tube and filament lamp

[OR]

b) Write a brief note on Grinder

SECTION – D

Answer any TWO Questions   **(2 × 14 = 28)**

21. What is a transformer? Describe the construction and its advantages.

22. Explain in detail about the function of LED

23. Discuss about the Instant water heater and immersion rod heater

24. Briefly explin the electric iron box with a neat diagram

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B.Sc. Physics Degree (Semester) Examinations, April 2023
Part–IV: Skill Based Course: Sixth Semester: Paper – I
NANOTECHNOLOGY
Under CBCS and LOCF – Credit 2
Time: **2** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. Who first used the term Nanotechnology?

   a) Richard Feymann   b) Norio Taniguichi

   c) Eric Drexler   d) Sumio Lijima

2. What is the general name for the class of structures made of rolled up carbon lattices?

   a) Nanorods   b) Nanotubes   c) Nanosheets   d) Fullerods

3. Carbon atoms make type of bond with other carbon atoms

   a) Covalent   b) Ionic   c) Metallic   d) Hydrogen

4. Sol-gel is _____ approach

   a) Bottom-up   b) Top-Down

   c) sputtering   d) chemical vapour deposition

5. The coordination number of a NaCl crystal is

   a) 4   b) 6   c) 12   d) 8

6. The process of modifying a metal's properties is called _____

   a) Electrolysis   b) Electro deposition

   c) Electro less plating   d) Electroplating

7. The energy separation between valence band and conduction band is called

a) Energy gap   b) Band gap   c) Fermi level   d) both a and b

8. SEM stands for

a) Scanning Electrode Microscope   b) Scanning Electrical Microscope

c) Scanning Electron Microscope   d) Scanning Emission Microscope

9. Sputtering is a_____

a) Physical Vapour deposition method

b) Chemical vapour deposition method

c) Chemical precipitation method

d) Chemical bath deposition method

10. An important consequence of using the UV-Visible spectroscopy is that

_____ of bonding structure

a) nanomaterial can be determined   b) emission wavelength

c) excitation wavelength   d) Band gap

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. What is Nanomaterial?

12. Write down the physical and chemical properties of nanomaterial.

13. Define Nanocomposite.

14. List out the seven crystal system

15. Define Bravais lattice.

16. Mention out the types of nanocomposite.

17. List out some characterization tools used for nanomaterials.

SECTION – C

Answer ALL Questions   **(3 × 9= 27)**

18. a) Explain about the surface, electrical, optical, thermal and mechanical properties of nanomaterials

[OR]

b) Give a brief account on the types of nanomaterials.

19. a) Explain about the various crystal bonding.

[OR]

b) Sketch out the seven crystal system and fourteen Bravais lattice.

20. a) Write down the role of Bottom-up and Top – down approach in nanotechnology

[OR]

b) Explain about the sol gel process in detail.

SECTION – D

Answer any TWO Questions   **(2 × 14 = 28)**

21. Illustrate the structural properties using X-Ray diffraction.

22. Discuss briefly about some important crystal structures.

23. Describe the surface morphological features using SEM techniques.

24. Discuss briefly about out the applications of nanomaterials to biology and medicine.

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B.Sc. Physics Degree (Semester) Examinations, April 2023
Part–IV: Skill Based Course: Sixth Semester: Paper – II
PHYSICS FOR COMPETITIVE EXAM.
Under CBCS and LOCF – Credit 2

Time: **2** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   ($75 \times 1 = 75$)

1. $M^1L^1T^{-1}$ is the dimension of
   a) power   b) momentum   c) force   d) couple

2. The unit of G in SI system is
   a) $Nm^{-2}kg^{-2}$ b) $Nm^{-2}s^{-2}$ c) Nms^{-2} d) Nm^2kg^{-2}

3. The SI unit of universal gas constant (R) is
   a) $JK^{-1}mol^{-1}$ b) $NK^{-1}mol^{-1}$ c) $WattK^{-1}mol^{-1}$ d) $ergK^{-1}mol^{-1}$

4. The dimensional formula for Planck's constant (h) is
   a) $[ML^2T^{-3}]$ b) $[ML^2T^{-2}]$ c) $[ML^2T^{-1}]$ d) $[ML^{-2}T^{-2}]$

5. Newton's first law of motion gives the concept of

   a) energy   b) work   c) inertia   d) momentum

6. A canon after firing recoils due to

   a) conservation of energy   b) backward thrust of gases produced

   c) Newton's third law of motion   d) Newton's first law of motion

7. A rocket or jet engine works on the principle of

   a) conservation of linear momentum

   b) conservation of angular momentum

   c) conservation of energy   d) conservation of mass

8. Two bodies of mass 1 kg and 4 kg are moving with equal kinetic energies. The ratio of their linear momentum is

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

9. The period of the pendulum is doubled when

   a) its length is doubled   b) the mass of the bob is doubled

   c) its length is made 4 times

   d) the mass of bob and the length of the pendulum are doubled

10. 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

11. The equivalence of two systems in thermal equilibrium is represented by the property

    a) temperature   b) heat   c) specific heat   d) energy

12. An ideal gas heat engine operates in a Carnot cycle between 227 ˚ C and 127 ˚ C. It absorbs 6×10^4 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

13. 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

14. A perfect gas is compressed to ¼ 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. In the propagation of electromagnetic waves the angle between the direction of propagation and plane of polarization is

    a) 0°   b) 45°   c) 90°   d) 180°

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 thermodynamic process, in which temperature of the system remains constant, is called

    a) isothermal   b) adiabatic   c) isomeric   d) isobaric

20. The frequency of a light wave is 6.4×10^{14} Hz. Its energy in eV will be ($h=6.6 \times 10^{-34}$ J-sec)

    a) 5.28 eV   b) 3.96 eV   c) 2.64 eV   d) 1.32 eV

21. A nuclear fusion reaction will occur in a gas of deuterium nuclei when the nuclei have an average kinetic energy of at least 0.72 MeV. If 1 eV = 1.6×10^{-19} J, the temperature required for nuclear fusion to occur with deuterium is about

    a) 5×10^{11} K   b) 5×10^{10} K   c) 5×10^9 K   d) 5×10^8 K

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 diople 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 proportional to

a) r^{-1}, r^{-2} b) r^1, r^{-1} c) r^{-2}, r^{-3} d) r^{-2}, r^{-2}

30. The velocity of an electron which passes through a potential difference of 1000 volts is

a) 1.87×10^7 m/s   b) 18.7×10^7 m/s

c) 0.187×10^7 m/s   d) 187×10^7 m/s

31. A condenser is charged through a potential difference of 200 volts and possesses a charge of 0.1 Coulomb. When discharged it would release an energy of
    a) 1 J   b) 2 J   c) 10 J   d) 20 J

32. Three condensers of capacitances 10, 20 and 30 µF are first connected in series and then connected in parallel) 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 µF) The distance between the plates is doubled. The new capacity is
    a) 8 µF   b) 4 µF   c) 2 µF   d) 1 µF

34. The effective resistance of three resistances $2\ \Omega$, $4\ \Omega$ and $6\ \Omega$ connected in parallel is
    a) 12/11 Ω b) 11/12 Ω c) 12 Ω d) 0 Ω

35. 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^2R b) nR   c) R/n   d) R/n^2

36. Two free parallel wires carrying currents in the opposite direction
    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 it
    a) 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 mm^2 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) remain indeterminate

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's 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/m^2. 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) cooling effect of electric current

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) $1/\omega L$
c) $\omega^2 L^2$
d) ωLR

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) $\tan^{-1}(0.4\pi)$
b) $\tan^{-1}(\pi)$
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 farad

49. In an LCR-series circuit R= $\sqrt{3}$ Ω, X_L = 10 Ω, X_C = 11 Ω, the applied 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-peak value is given by
a) $E_{rms}/\sqrt{2}$
b) $\sqrt{2} E_{rms}$
c) $2\sqrt{2} E_{rms}$
d) $E_{rms}/2$

51. The electron beam with velocities in the ratio 1:2 is subjected to identical magnetic fields at right angles to them. The ratio of the deflections produced 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 number of possible elements would be
a) 60
b) 32
c) 4
d) 64

53. A proton, deuteron, and an α – particle are accelerated by the same potential difference. Their velocities will be in the ratio of
a) 1:1:1
b) $\sqrt{2}$:1:1
c) 1:1:$\sqrt{2}$
d) 1:$\sqrt{2}$:1

54. "There are discrete energy levels in atoms and molecules" 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 intensity of X-rays depends upon

a) kinetic energy of the electron striking the target

b) number of electrons striking the target

c) total momentum of the electron   d) none of the above

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) none of the above

57. Light of two different frequencies, whose photons have energies 1 eV and 2.5 eV respectively, successively illuminate a metal whose work function is 0.5 eV. The ratio of the maximum speeds of the emitted electrons will be

a) 1:5   b) 1:4   c) 1:2   d) 1:1

58. Wave nature of matter is not apparent to our daily observations because

a) wavelength of the waves associated with the pretty heavy masses is very small

b) wavelength of the waves associated with the pretty heavy masses is very large

c) bodies travel with very large velocities   d) none of the above

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) $h\Big/\sqrt{2mVe}$ c) $h\sqrt{2mVe}$ d) $\dfrac{\sqrt{2mV}}{eh}$

60. If the de Broglie wavelengths of an alpha particle and neutron are the same, then the velocity of

a) alpha particle is greater than that of neutron

b) neutron is greater than that of alpha particle

c) both neutron and alpha particle is same

d) none of the above

61. The uncertainty principle is applicable only when

a) position is measured after the momentum

b) momentum is measured after the position

c) position and momentum are measured simultaneously

d) none of the above

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. Which of the following is not a mode of radioactive decay?

a) positron emission

b) electron capture

c) fusion

d) alpha decay

64. Nuclear force exist between

a) proton-proton   b) neutron-neutron

c) neutron-proton   d) all of the above

65. The phenomenon of nuclear fission to a certain extent can be easily explained by

a) liquid drop model   b) shell model

c) collective model   d) central force field model

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) 4800×10^6 Joules   d) 1728×10^{10} Joules

67. With increase in temperature, the electrical conductivity of intrinsic semi-conductor

a) increases

b) decreases

c) first decreases and then increases

d) first increases and then decreases

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 K

69. One prefers to use a transistor as common emitter amplifier, because

a) the current gain is very large and hence the power gain increases

b) the current gain is small

c) it is more safe to operate

d) none of the above

70. A bridge rectifier is preferred to an ordinary two-diode full wave rectifier because

a) it has four diodes

b) it has higher safety factor

c) its transfer has no centre tap

d) it needs much smaller transformer for the same output

71. The three axes of a crystal lattice are mutually perpendicular and two of the lattice parameters are equal. The crystal system is

a) tetragonal   b) trigonal

c) rhombohedral   d) cubic

72. In a simple cubic lattice $d_{100} : d_{110} : d_{111}$ is

a) $\sqrt{6} : \sqrt{3} : \sqrt{2}$ b) $6 : 3 : 2$

c) $6 : 3 : \sqrt{2}$ d) $\sqrt{6} : \sqrt{3} : \sqrt{4}$

73. Stars radiate light of their own because of

a) fission reactions   b) chemical reactions

c) mechanical contractions   d) fusion reactions

74. The binary code of $(21.25)_{10}$ is

a) 10100.001   b) 10101.001   c)10101.010   d) 10100.100

75. NAND and NOR gates are called universal gates primarily because they

a) are widely used in IC packages   b) are easier to manufacture

c) can be combined to produce OR, AND and NOT gates

d) none of the above

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ASTROPHYSICS
Under CBCS and LOCF – Credit 2
Time: **2** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. Regolith Means

   a) Earth soil   b) lunar soil   c) mars soil   d) pebble

2. The most familiar and characteristics features on the moon are its _____

   a) mountains   b) craters   c) maria   d) volcanoes

3. Central Part of the sun is known as

   a) Core   b) Photosphere   c) Corona   d) mesosphere

4. The lighter region of the sunspot is

   a) Chromosphere   b) Penumbra

   c) umbra   d) transition region

5. A white dwarf is _____ star.

   a) new born   b) dead   c) living   d) transparent

6. A cold star emits more of their light at _____wavelength

   a) short   b) long   c) medium   d) ratio

7. Mass of our galaxy is about _____billion times that of the sun.

   a) 200   b) 250   c) 150   d) 100

8. The amount of gas and dust in our galaxy is comparable to that in other.

   a) ellipticals   b) spirals

   c) barred spirals   d) irregulars

9. The ability of a telescope to separate the angular distance between

   neighbouring 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 infinite

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. What is Maria?

12. Sketch the layers in the atmosphere.

13. Sun is a star – Justify

14. Define Protostar.

15. What is the Photosphere?

16. What is an optical telescope?

17. What are irregular galaxies?

SECTION – C

Answer ALL Questions   **(3 × 9= 27)**

18. a) Write a short note on Moon.

[OR]

     b) Explain the history of the earth with diagram.

19. a) Explain the concept of Solar wind.

[OR]

     b) Explain about the structure of the sun with neat diagram.

20. a) Explain about Big Bang theory in detail.

[OR]

     b) Write a short note on Radio telescope.

SECTION – D

Answer any TWO Questions   **(2 × 14 = 28)**

21. Explain solar and lunar eclipses with neat diagram.

22. Discuss in detail about the sunspot and sunspot cycle with diagrams.

23. Briefly describe the classification of galaxies and explain its structures.

24. Differentiate between reflecting telescope and refracting telescope.

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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., B.Com. & B.Com.(CA) Degree (Semester) Examinations, April 2023
HOUSE WIRING – II
Time: **2** Hours   **CERTIFICATE COURSES**   Max. Marks: **50**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. What is the function of the tester?
2. What is multimeter?
3. Mention the domestic (Home) supply voltage.
4. Name the colours used in the three-phase supply wire.
5. List out the different types of switches used in our daily life.
6. What is LED?
7. What is MCB?
8. What is A.C?
9. Sketch the parts in the 3-pin plug.
10. What is D.C?

SECTION – B

Answer ALL Questions   **(4 × 5 = 20)**

11. a) What is an Earthing system? Why should you have an Earthing system?

[OR]

b) Examine the function of soldering rod.

12. a) Draw the symbols for i) Cell   ii) Battery   iii) Earth   iv) Ceiling Fan   v) Danger.

[OR]

b) Write a short note on MCB.

13. a) Give a brief account on UPS and Battery functions.

[OR]

b) What are the precautions to be taken to prevent electric shock.

14. a) List out the tools used for electrical works in our daily life.

[OR]

b) Write down about the sodium and mercury lamp.

SECTION – C

Answer any TWO Questions   **(2 × 10 = 20)**

15. Explain how to connect the wires in switch board
16. Explain about the remedial measures to be taken during electric-related injury.
17. Discuss briefly about the functions of ceiling fan.

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B.A. & B.Sc. Degree (Semester) Examinations, April 2023
Part–IV: Generic Elective Course: Second Semester: Paper – I
CIVIL DEFENCE AND ADVENTURE TRAINING
Under CBCS and LOCF – Credit 2

Time: **2** Hours   Max. Marks: **75**

SECTION – A

Answer ALL Questions   **(10 × 1 = 10)**

1. The strength of the Guard of Honor for Prime minister is

    a) 100   b) 150   c) 50   d) 125

2. The word of command baen mur is meaning of

    a) left turns   b) stand at ease   c) right turn   d) Stand easy

3. Sequence of fire control order is

    a) GRIT   b) RITG   c) ITGR   d) GRID

4. In MR, yellow color represents

    a) Reserved forest   b) Cultivated area

    c) living area   d) dry river

5. Cadets stand one behind another is called

    a) file   b) Rank   c) blank file   d) None of these

6. Normal rate of firing for 7.62mm SLR is

    a) 20 rounds/min   b) 25 rounds/min

    c) 30 rounds/min   d) 40 rounds/min

7. A Section consist of

   a) 10 soldiers   b) 20 soldiers   c) 15 soldiers   d) 25 soldiers

8. For NCC training, the obstacle course consists of

   a) 10 obstacle   b) 12 obstacle   c) 15 obstacle   d) 5 obstacle

9. self- help measures adopted by civilian population are called

   a) self Defence   b) civil Defence

   c) Rescue service   d) salvage service

10. Two or more persons share some idea or information via some media is

    called

    a) communication   b) transmission

    c) receiver   d) Transreceiver

SECTION – B

Answer any FIVE Questions   **(5 × 2 = 10)**

11. Write the parts of word of command.

12. Define civil Defence.

13. What are the types of north?

14. Draw the conventional sign and military symbols of

       i) Temple   ii) fort

15. What is the meaning of patrol?

16. Write the uses of service protector.

17. Define the term "line tor".

SECTION – C

Answer ALL Questions   **(3 × 9= 27)**

18. a) Write the five objectives of Drill

                    [OR]

    b) Explain the different services in the Civil Defence.

19. a) Explain the different types of 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.

SECTION – D

Answer any TWO Questions   **(2 × 14 = 28)**

21. Write down the parts of 7.62mm SLR with neat diagram.

22. Describe the Characteristics of INSAS rifle.

23. Explain the different methods of communication.

24. Explain the different obstacle training.

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