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B.Sc. Maths/Chemistry Degree (Semester) Examinations, April 2022
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 condition for brightness in the reflected system is

   a) $2nt \cos r = (2m + 1)\lambda/2$ b) $2nt \sin r = (2m + 1)\lambda/2$

   c) $2nt \cos r = (2m + 1)\lambda/4$ d) $2nt \cos r = (2m + 1)\lambda/6$

2. Crystals which possess only _____ optic axis are called uniaxial crystals

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

3. The velocity of an electron in the inner most orbit of an atoms is

   a) highest   b) lowest   c) mean   d) zero

4. Direct evidence for the existence of magnetic moments of atoms and their

   space quantisation is provided by the experiment _____

   a) Jaegars method   b) Michelson

   c) Stern-Gerlach   d) Laurent's polarimeter

5. The energy equivalent of a mass unit is
   a) 950.00 MeV   b) 931.49 MeV
   c) 933.12 MeV   d) 940.34 MeV

6. The fissionable material is known as
   a) petrol   b) fuel   c) coal   d) nucleus

7. The theory of general relativity was developed by _____
   a) Michael Faraday   b) Albert Einstein
   c) Newton   d) George Boole

8. The shortening or contraction in the length of an object along its direction of motion is

  a) Lorentz force contraction   b) Lorentz – Galilean contraction

  c) Lorentz – Fitzgerald contraction   d) none of the above

9. The diode which operates in the reverse breakdown region with a sharp voltage is called _____

  a) LED   b) Zener diode   c) Photo diode   d) Triac diode

10. The inverter gate is _____

  a) NOT gate   b) OR gate   c) AND gate   d) Ex-OR gate

SECTION – B

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

11. Write the conditions for maxima and minima in interference.

12. State Pauli's exclusion principle.

13. Define mass defect.

14. What is called frame of reference?

15. Give the truth table of NAND gate and explain.

16. What is double refraction?

17. What is meant by time dilation?

SECTION – C

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

18. a) Differentiate between interference and diffraction.

[OR]

  b) The light of wavelength 5000 Å is incident normally on a plane transmission grating. Find the difference in angles of deviation in the first and third order spectra. The number of lines per cm on the grating surface is 6000.

19. a) Give the two concepts of vector atom model.

[OR]

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

20. a) Explain the variation of binding energy with mass number by a graph and discuss its features.

[OR]

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

21. a) State and explain the postulates of special theory of relativity.

[OR]

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

22. a) State and prove De-Morgan's theorem.

[OR]

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

SECTION – D

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

23. What is a grating? Explain the construction and theory of plane transmission grating.

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

25. Explain the principle and working of nuclear reactor.

26. Derive the Lorentz transformation equations.

27. With neat sketch, describe an experiment to obtain the I-V characteristics of a Zener diode.

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B.Sc. Physics Degree (Semester) Examinations, April 2022
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. Which of the following is expected to have highest thermal conductivity?

 a) steam   b) solid ice   c) melting ice   d) boiling water

2. Stefan-Boltzmann law is applicable for heat transfer by

 a) conduction   b) convection

 c) radiation   d) conduction and radiation combined

3. The region inside the inversion curve has_____Joule-Kelvin

 coefficient and the region outside inversion curve has_____Joule-

 Kelvin coefficient.

 a) positive, positive   b) negative, negative

 c) negative, positive   d) positive, negative

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. The efficiency of a reversible Carnot's engine working between
 temperature T_1 and T_2 ($T_1 > T_2$) is

 a) $\dfrac{T_1}{T_2}$ b) $\dfrac{T_2}{T_1}$ c) $\left(1 - \dfrac{T_2}{T_1}\right)$ d) $\left(\dfrac{T_1}{T_2} - 1\right)$

6. The efficiency of a general cycle will be_____the efficiency of a
 reversible cycle.
 a) equal to   b) less than
 c) equal to or greater than   d) equal to or less than

7. In the equilibrium state

 a) probability is maximum

 b) β parameters of two systems are equal

 c) probability is maximum as well as β parameters of two systems are equal

 d) number of particles is maximum

8. The total energy of a molecule is shared equally by the various degrees of freedom possessed by it. This law is known as

 a) law of conservation of energy   b) law of equipartition of energy

 c) law of degradation of energy   d) Maxwell-Boltzmann law

9. The spin of photon is

 a) zero   b) $\hbar/2$ c) $\hbar$ d) $3\hbar/2$

10. In which the probability of occupation index can tend to zero?

 a) Maxwell-Boltzmann   b) Fermi-Dirac

 c) Bose-Einstein   d) classical statistics

SECTION – B

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

11. State Wiedemenn-Franz law.

12. Define solar constant.

13. What are critical constants?

14. What is isochoric process?

15. Define degrees of freedom.

16. Define Phase space.

17. Define the terms Fermions and Bosons.

SECTION – C

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

18. a) Explain how 'K' will be calculated by cylindrical flow of heat.
   [OR]
   b) An aluminium foil of relative emittance 0.1 is placed in between two concentric spheres at temperatures 300 K and 200 K respectively. Calculate the temperature of the foil after the steady state is reached. Assume that the spheres are perfect black body radiators. Also calculate the rate of energy transfer between one of the spheres and the foil. ($\sigma =$ 5.672 X 10^{-8} M.K.S Units)

19. a) Describe liquefaction of air by Linde's process.
   [OR]
   b) Calculate the Vander Walls constants for dry air, given that T_c = 132 K, P_c = 37.2 atmospheres, R per mole = 82.07 cm^3 atmos K^{-1}.

20. a) Derive the expression for work done during an adiabatic process.
   [OR]
   b) A Carnot's engine is operated between two reservoirs at temperatures of 450 K and 350 K. If the engine receives 1000 calories of heat from the source in each cycle. Calculate the amount of heat rejected to sink in each cycle. Calculate the efficiency of heat engine and work done by the engine in each cycle.

21. a) State the law of equipartition of energy. Derive the expression for the same.
   [OR]
   b) A system consists of 6000 particles distributed in three energy states with equal spacing. The energy of the three states are E_1 = 0, E_2 = x and E_3 = 2x. All the three states have the same intrinsic probability g. At a certain instant, there are 3000 particles in the lower level, 2500 in the middle level and 500 in the upper level. Compare the relative probabilities with the distribution obtained by the transfer of one particle from the middle to the lower level and one particle from the middle to the upper level and the original distribution.

22. a) Compare the three types of statistics.

[OR]

b) Calculate the probabilities for an electronic state to be occupied at 20°C if the energy of these states lies 0.11 eV above and 0.11 eV below the Fermi level.

SECTION – D

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

23. State and Explain Stefan's law. Apply Stefan's law to derive the

  equation of Newton's law of cooling.

24. Explain Porous Plug experiment with necessary theory. Discuss the results.

25. Explain Carnot's cycle with neat diagram.

26. Discuss Maxwell's law of distribution of velocity.

27. Explain in detail about Fermi-Dirac distribution law.

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B.Sc. Physics Degree (Semester) Examinations, April 2022
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 × 1 = 10)**

1. The ratio between phase difference and path difference is

   a) $\dfrac{2\pi}{\lambda}$ b) $\dfrac{\lambda}{2\pi}$ c) $\dfrac{\pi}{\lambda}$ d) $\dfrac{3\pi}{\lambda}$

2. The condition for destructive interference is path difference should be

   equal to

   a) odd integral multiple of wavelength

   b) Integral multiple of wavelength

   c) odd integral multiple of half wavelength

   d) Integral multiple of half wavelength

3. The separation between screen and aperture in Fraunhofer diffraction is

   a) Very small   b) very large   c) intermediate   d) none of these

4. X-ray diffraction can only be applied to

   a) Gaseous or vapour materials   b) solid, crystalline materials

   c) liquids   d) all of the above

5. Optically isotropic materials are _____

   a) liquids   b) amorphous solids

   c) crystalline solids with cubic symmetry   d) all the above

6. The intensity of light incident on a polariser is I and that of the light emerging from it is also I. The light incident on the polariser is

a) Circularly polarized   b) unpolarised

c) polarized   d) elliptically polarised

7. The average energy in one time period in simple harmonic motion is

a) $\frac{1}{2} \omega^2 A^2$ b) $2m\omega^2 A^2$ c) $m\omega^2 A^2$ d) zero

8. Displacement-time graph depicting an oscillatory motion is

a) Cosine curve   b) sine curve

c) tangent curve   d) straight line

9. Condition for constructive interference of two sound waves in terms of phase difference is $\Delta\Phi = $ _____

a) $m(2\pi)$ b) $\pi/2$ c) $\pi/4$ d) $2\pi/m$

10. When a sound wave is reflected, the closed end is a pressure _____

a) node   b) antinode   c) one   d) zero

SECTION – B

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

11. Define the term incoherence.

12. What is an interferometer?

13. State Bragg's law.

14. What is holography?

15. What is quarter wave plate?

16. What is physical pendulum?

17. Define sound level in a logarithmic scale of intensity.

SECTION – C

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

18. a) Derive the relation for intensity in double silt interference.
[OR]
   b) Two straight and narrow parallel silts 1 mm apart are illuminated by monochromatic light. Fringes formed on the screen held at a distance of 100 cm from the silts are 0.50 mm apart. What is the wavelength of light?

19. a) Distinguish between Fresnel and Fraunhofer diffraction.
[OR]
   b) Calculate the minimum number of lines per cm in a 2.5 cm grating which will just resolve the sodium lines (5890 Å and 5896 Å) in the second order spectrum

20. a) What do you mean by polarization? How do you describe a linearly polarized wave?
[OR]
   b) A quartz quarter wave plate is to be used with sodium light of wavelength λ=589 nm. What is the minimum thickness of such a plate? Given the refractive indices of the ordinary and extraordinary wave are n_o = 1.544; n_e = 1.553.

21. a) How do you convert two body oscillating system into a single body oscillating system?
[OR]
   b) A uniform disc of radius 5 cm and mass 200 g is fixed at its centre to a metal wire, the other end of which is fixed with a clamp. The hanging disc is rotated about the wire through an angle and released. If the disc makes torsional oscillations with time period 0.20 s, find the torsional constant of the wire.

22. a) Prove that the speed of sound in a fluid depends on the properties of the medium.
[OR]
   b) An aeroplane is going towards east at a speed of 510 km/h at a height of 2000 m. At a certain instant, the sound of the plane heard by a ground observer appears to come from a point vertically above him. Where is the plane at this instant? Speed of sound in air = 340 m/s.

SECTION – D

Answer any THREE Questions   **(3 × 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. Derive an expression for width of the maxima in grating.

25. Explain about polarizer, analyser and applications of polarization.

26. Derive the displacement, velocity and acceleration of a particle
 executing simple harmonic oscillation.

27. How do you calculate the power and intensity of the sound waves in fluids?

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B.Sc. Physics Degree (Semester) Examinations, April 2022
Part – III: Core Course: Fourth Semester: Paper – I
ANALOG ELECTRONICS
Under CBCS and LOCF – Credit 5

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

SECTION – A

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

1. A crystal diode has forward resistance of the order of _____

   a) kΩ b) Ω c) MΩ d) mΩ

2. The doping level in a zener diode is _____ that of a crystal diode
   a) the same as   b) less than   c) more than   d) double times

3. The number of depletion layer in a transistor is _____
   a) four   b) three   c) one   d) two

4. The output impedance of a transistor is_____
   a) high   b) zero   c) low   d) very low

5. Transistor biasing is done to keep _____ in the circuit.
   a) proper direct current   b) proper alternating current
   c) the base current is small   d) collector current small

6. RC coupling is used for
   a) voltage amplification   b) current amplification
   c) power amplification   d) voltage stabilization

7. An oscillator employs _____ feedback.
   a) Positive   b) negative
   c) neither a or b   d) data insufficient

8. In a Colpitt's oscillator, feedback is obtaining _____
   a) by magnetic induction   b) by the tickler coil
   c) from the centre of split capacitor   d) from the centre of induction

9. In a transmitter _____ oscillator is used.

   a) Hartley   b) RC phase-shift   c) wien-bridge   d) crystal

10. In radio transmission, the medium of transmission is _____

   a) space   b) an antenna   c) cable   d) OFC

SECTION – B

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

11. What is reverse resistance?

12. Define ripple factor.

13. Define operating point.

14. What is meant by power rating of transistor?

15. What is known as transistor biasing?

16. Describe tank circuit.

17. What is modulation?

SECTION – C

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

18. a) Explain how the Zener diode used as a voltage regulator.
    [OR]
    b) An ac supply of 230 V is applied to a half wave rectifier circuit through a transformer of turn ratio 10:1.
    Find i) the output dc voltage and   ii) the peak inverse voltage.

19. a) Describe how transistor circuit acted as an amplifier in CE arrangement.
    [OR]
    b) The data sheet of a JFET gives the following information I_{DSS}= 3mA, $V_{GS (off)}$ = -6V and $g_{m (max)}$ = 5000µS. Determine the transconductance for V_{GS}= -4V and find drain current I_D at this point.

20. a) Derive an expression for stability factor of a transistor.
    [OR]
    b) In transistor circuit if R_c=10KΩ, R_L=10KΩ, R_{in}=2.5 kΩ, β = 100, find the output voltage for an input voltage of 1mV r.m.s.

21. a) Draw the Colpitt's oscillator circuit and explain it's working.
    [OR]
    b) A 1 pF capacitor is available. Choose the inductor values in a Hartley oscillator so that f = 1MHz and m_v = 0.2.

22. a) List the types of AM radio receiver and discuss about straight radio receiver.
    [OR]
    b) A carrier waves of frequency 10 MHz and peak value 10V is amplitude modulated by a 5 kHZ sine wave of amplitude 6V. Determine i) modulation factor   ii) sideband frequencies and iii) amplitude of sideband components. Draw the frequency spectrum.

SECTION – D

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

23. Summarize the efficiency of half wave rectifier and full wave rectifier.

24. Illustrate the working of JFET.

25. What do you infer from the base resistor method?

26. Summarize the applications of Op-amp.

27. Demonstrate the radio broadcasting transmission and reception.

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B.Sc. Physics Degree (Semester) Examinations, April 2022
Part – III: Core Course: Fourth Semester: Paper – II
NUMERICAL METHODS
Under CBCS and LOCF – Credit 4

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

SECTION – A

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

1. $f(x) = 2x^3 - 9x^2 + 12x + 6$ is a polynomial of degree

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

2. Choose the transcendental equation from the following _____

  a) $x^3 - 1 = 0$ b) $x^2 + x + 1 = 0$ c) $x = 1$ d) $e^x - 1 = 0$

3. Gauss-Elimination method of solving Simultaneous Linear Algebraic
Equation is
  a) direct method   b) indirect method
  c) iterative method   d) interactive method

4. The following system of equations has _____ solution(s).
  x + y = 2; 6x+6y =12
  a) no   b) infinite   c) two   d) unique

5. Polynomial Interpolation is used to compute
  a) values of argument   b) integration
  c) differentiation   d) all the above

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. Trapezoidal rule is derived from _____ formula.
   a) Newton-Cotes   b) Newton's forward interpolation
   c) Newton's backward interpolation   d) Inverse Lagrange's

9. The differential equation $2\dfrac{dy}{dx} + x^2 y = 2x + 3, \; y(0) = 5$ is
   a) linear   b) nonlinear
   c) linear with fixed constants   d) undeterminable to be linear or nonlinear

10. Numerical solutions of linear algebraic equations can be obtained by
    a) Euler's modified method   b) Runge -Kutta Method
    c) Euler's method   d) Newton's method

SECTION – B

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

11. State the fundamental theorem from the theory of equations.

12. What is the disadvantage of Bisection method?

13. What do you mean by simultaneous linear algebraic equations?

14. Distinguish between Gauss Elimination and Gauss-Jordan method.

15. Give the main features of Gregory-Newton's forward interpolation formula.

16. Write down the Newton-Cote's quadrature formula.

17. Give the equations of fourth order Runge-Kutta algorithm.

SECTION – C

Answer ALL Questions   **(5 × 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.

19. a) Solve by Gauss-Elimination method
    $2x + 3y - z = 5$;
    $4x + 4y - 3z = 3$;
    $2x - 3y + 2z = 2$
    [OR]
    b) Solve the system of equations by Gauss-Seidel method.
    $x + y + 54z = 110$;
    $27x + 6y - z = 85$;
    $6x + 15y + 2z = 72$

20. a) The following table 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) 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

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 $I = \int_0^6 \dfrac{dx}{(1+x)}$ using (i) Trapezoidal rule (ii) Simpson's rule.

22. a) 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.
    [OR]
    b) Compute y(0.3) given $\dfrac{dy}{dx} + y + xy^2 = 0$; y(0) = 1 by taking h = 0.1 using Runge-Kutta method of fourth order (correct to 4 decimals).

SECTION – D

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

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

24. Solve by Gauss-Seidel method

  10x – 5y – 2z = 3;

  4x – 10y + 3z = -3;

  x + 6y + 10z = -3

25. Derive Gregory-Newton forward interpolation formula.

26. Find the first two derivatives of $(x)^{1/3}$ at x = 50 and x = 56 given the

  table below

x	50	51	52	53	54	55	56
Y = x$^{1/3}$	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

27. Using Taylor method, compute y(0.2) and y(0.4). Correct to four

  decimal places given $\dfrac{dy}{dx}$ = 1-2xy and y(0) = 0

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B.Sc. Physics Degree (Semester) Examinations, April 2022
Part – III: Core Course: Sixth Semester: Paper – I
NUCLEAR PHYSICS
Under CBCS and LOCF – Credit 5

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

SECTION – A

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

1. The spin value of proton and neutron is

   a) 1/2   b) 0   c) 3/2   d) 1

2. Which is a modified form of the Lawrence cyclotron?
   a) Proportional counter   b) Synchrocyclotron
   c) Ionisation Chamber   d) Betatron

3. The α – spectrum provides conclusive evidence of the existence of discrete energy levels in a
   a) electron   b) atom   c) neutron   d) nucleus

4. The curie is defined as the quantity of a radioactive substance which gives
   a) 3.70×10^{10} disintegrations / second
   b) 3.70×10^{5} disintegrations / second
   c) 3.70×10^{8} disintegrations / second
   d) 3.70×10^{3} disintegrations / second

5. A large number of isotopes are obtained from nuclear reactors by the_____ process
   a) electron radiative   b) proton radiative
   c) neutron radiative   d) deuteron radiative

6. Slow neutrons are neutrons with energies from zero to about
   a) 100 eV   b) 10 keV   c) 1000 eV   d) 100 keV

7. Why is it necessary to accelerate positively charged nuclei to high kinetic energies to cause fusion?
   a) to overcome electrical repulsive forces

b) to result in high amount of energy in short period of time

c) to get the isobars and isotopes   d) to get a sustainable reaction

8. Which of the following part in a nuclear reactor minimizes the neutron leakage?

a) shield   b) control rods   c) reflector   d) moderator

9. Force that acts on both quarks and leptons is

a) strong nuclear force   b) weak interaction

c) intermediate interaction   d) nuclear force

10. If the average density of the Universe is less 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 Packing fraction.

12. Define Binding Energy of the nucleus.

13. What is the meaning of end point energy?

14. Explain the term mean life.

15. List any two advantages of neutron diffraction.

16. Write the principle of atom bomb.

17. What are Baryons?

SECTION – C

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

18. a) Apply meson theory of nuclear forces to derive the relation for one pion exchange potential.

[OR]

b) The radius of Ho^{165} is 7.731 Fermi. Deduce the radius of He^4

19. a) Explain about α particle spectra.

[OR]

b) Find the activity of 1 mg (10^{-6}kg) of radon.

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

[OR]

b) In the photodisintegration equation for the deuteron the threshold energy is 2.227 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 chain reactions.

[OR]

b) A reactor is developing energy at the rate of 3000kW. How many atoms of U^{235} undergo fission per second? How many kilograms of U^{235} would be used in 1000 hours of operation assuming that on an average energy of 200Mev is released per fission?

22. a) Explain about Quark model.

[OR]

b) From baryon number laws, find which of the following reaction is allowed.

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

ii) $\pi^- + P \rightarrow \Lambda^0 + \pi^0$

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. Outline Gamow's theory of alpha decay and explain how it leads to Geiger-Nuttal law.

25. Summarise the applications of radio isotopes.

26. Explain in detail about nuclear reactor.

27. Write the fundamental interaction between the elementary particles.

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B.Sc. Physics Degree (Semester) Examinations, April 2022
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. X-rays lose energy when they pass through matter is due to _____
   a) photoelectric effect   b) Compton effect
   c) work function   d) critical frequency

2. Einstein's photo electric equation is _____
   a) $h\upsilon = \Phi + \frac{mv^2}{2}$ b) $\upsilon = \Phi + \frac{mv^2}{2}$
   c) $h\upsilon = \Phi + \frac{mv^3}{4}$ d) $h = \Phi + \frac{mv^2}{2}$

3. Which one of the following pairs of phenomena illustrates the particle
   aspect of wave particle duality?
   a) Compton effect and Bragg's law
   b) photoelectric effect and Compton effect
   c) Compton effect and Pauli's principle
   d) Bragg's law and photoelectric effect

4. Davisson and Germer experiment confirm
   a) the value of Planck's constant   b) the wave nature of electrons
   c) the nuclear size   d) ratio of $\frac{e}{m}$ value

5. A hydrogen atom remains in its ground state when electron
   a) resides inside the nucleus   b) escape from the atom
   c) is in its first orbital   d) does not orbit round but is stationary

6. The spherical polar coordinates of the hydrogen atom are
   a) length of radius vector from origin 0 to point P   b) zenith angle Ө
   c) azimuth angle Φ   d) all the above

7. The expectation value of a Hermitian operator is always _____
   a) same   b) conjugate   c) negative   d) real

8. The probabilities of transmission through a potential barrier of height V_0
   and width a for a particle of energy E ($E<V_0$) _____
   a) is inversely proportional to the width a of the barrier
   b) is directly proportional to the width a of the barrier
   c) does not depend on the width of the barrier
   d) decreases exponentially with the width a of the barrier

9. If the mass of an object changes, what will also change
   a) speed of light   b) velocity   c) energy   d) distance

10. According to Twin paradox, which of the following concept is related to relativity
   a) time dilation   b) length contraction
   c) mass variation   d) addition of velocities

SECTION – B

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

11. Calculate the work function of sodium in electron volts, given that the
    threshold wavelength is $6800 \overset{o}{A}$ and h = 6.625 x 10^{-34} JS.

12. State Heisenberg's uncertainty principle.

13. Define zero-point energy.

14. If $\hat{x}$ and $\hat{y}$ are two operators, prove that $[\hat{x}\,\hat{y}] = -\,[\hat{y}\,\hat{x}]$.

15. What is Newtonian relativity?

16. What is a frame of reference?

17. What are matter waves?

SECTION – C

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

18. a) Describe briefly Lenard's method to determine e/m of photo electrons.
                      [OR]
    b) The photo electric threshold for a metal is $3000 \overset{o}{A}$. Find the kinetic
       energy of an electron ejected from it by radiation of wave length 12000
       $\overset{o}{A}$

19. a) Derive an expression for group velocity of a wave packet.
                      [OR]
    b) An electron has a speed of 600 ms^{-1} with an accuracy of 0.005 %.
       Calculate the certainty with which we can locate the position of the
       electron h = 6.6 x 10^{-34} JS and m = 9.1 x 10^{-31} kg.

20. a) Derive Schrodinger's time dependent equation.
                      [OR]
    b) Calculate the permitted energy levels of an electron, in a box $1 \overset{o}{A}\ wide$.

21. a) List the basic postulates of wave mechanics.
                      [OR]
    b) Which of the following are eigen functions of the operator $\frac{d^2}{dx^2}$?
       Give the eigen value where appropriate
       (a) $\sin x$ (b) $\cos x$ (c) e^x (d) e^{ix} (e) $\sin^2 x$

22. a) Discuss the Michelson-Morley experiment. Explain how the result
       obtained is interpreted by the principle of relativity.
                      [OR]
    b) At what speed is a particle moving of the mass is equal to three times
       its rest mass?

SECTION – D

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

23. Derive Einstein's Photo- electric equation and describe Millikan's
    experiment to verity the same.

24. Describe Mathematical proof of Uncertainty principle for one
    dimensional wave- packet.

25. Give quantum mechanical theory of linear harmonic oscillator and
    obtain an expression for its zero-point energy.

26. Solve the Schrodinger equation for a particle in three-dimensional square
    well potential. Derive expression for transmission coefficient and explain
    its significance.

27. Discuss Minkowski four- dimensional space.

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[Affiliated to Madurai Kamaraj University]
B.A. & B.Sc. Degree (Semester) Examinations, April 2022
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 $\times$ 1 = 10)

1. A wire coming from the ground from an electrode plate is

   a) Earthing   b) Transformer   c) lamp   d) heater

2. LED stands for _____

   a) Light Emitting diode   b) Light Emission Diode

   c) Light Emitting Detector   d) None of these

3. Which of the following used for control the electric fire

   a) sand   b) water   c) woolen cloth   d) acid

4. The incandescent lamps are classified according to the material used for the

   a) current   b) glass   c) resistance   d) filament

5. The An electric heater is an electrical appliance that converts electrical

   energy in to

   a) sound   b) light   c) heat   d) all the above

6. The combination of the nichrome is

   a) nickel and chlorine   b) nickel and chromium

   c) sodium and aluminium   d) aluminium   and steel

7. The term AC stands for

  a) Automatic Current   b) Alternating Current

  c) All Current   d) Available Current

8. The transformer works on the principle of

  a) Ohm's law   b) Joule heating effect

  c) mutual induction   d) Snell's law

9. The life hours of florescent tube are

  a) 100 hours   b) 1000 hours   c) 5000 hours   d) 10000 hours

10. The term CFL stands for

  a) Compact Fluorescent Lamp   b) Compact Fluid Lamp

  c) Common Fluorescent Lamp   d) Compact Fluorescent Light

SECTION – B

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

11. What is A.C?

12. What is D.C?

13. What are the materials used in fuse wire?

14. What is MCB?

15. List out the types of lamps.

16. Write down the number 4 in the LED format.

17. What is soldering rod?

SECTION – C

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

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

[OR]

  b) Draw the symbol for the following: a) Earth   b) Transformer

    c) Cell   d) Battery   e) Resistance

19. a) Discuss briefly about the different type sofa lamp used for lighting.

[OR]

  b) Explain about the functions of the electric mixer.

20. a) Explain the function of LED.

[OR]

  b) Explain about the switch board connection for domestic purpose.

SECTION – D

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

21. What is earthing? What is the necessity of earthing using in the electrical appliances and machines?

22. What are the precautions to be taken to prevent electric shock and also precautions should be observed while working in the electrical appliances and equipment?

23. Sketch the different parts of iron box and explain it in detail.

24. Explain about the functions of transformer.

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B.Sc. Physics Degree (Semester) Examinations, April 2022
Part – IV: Skill Based Courses: Fourth Semester: Paper – I
ASTROPHYSICS
Under CBCS and LOCF – Credit 2

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

SECTION – A

Answer ALL Questions   (10 × 1 = 10)

1. When the Moon's shadow crosses the earth's surface, the eclipse occurred is

   a) Solar eclipse   b) lunar eclipse

   c) solar flare   d) solar wind

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

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

3. Visible part of the sun is known as

   a) Chromosphere   b) Photosphere

   c) Corona   d) mesosphere

4. The dark region of the sunspot is

   a) Chromosphere   b) Photosphere

   c) umbra   d) transition region

5. A white dwarf is _____ star.

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

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 times that of the sun.

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

8. The spiral galaxies according to their size of the nuclei are classifieds 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

   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. Sketch the different layers in the atmosphere.

12. What is Maria?

13. Sun is a star- Justify

14. Define protostar.

15. List out the different types of galaxies.

16. What is radio telescope?

17. State Hubble's law.

SECTION – C

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

18. a) Write short notes on i) History of the earth ii) Interior of the Moon

   [OR]

   b) Explain the concept of solar wind.

19. a) Derive an expression for the luminosity of the star.

   [OR]

   b) Explain Supernova explosion in detail.

20. a) Explain structure of milky way galaxy with suitable diagram.

   [OR]

   b) Differentiate between reflecting telescope and refracting 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

   and differential galactic rotation with relevant diagram.

24. Explain about reflecting and refracting telescope in detail.

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B.Sc. Physics Degree (Semester) Examinations, April 2022
Part – IV: Skill Based Courses: 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. Which of the following component used in the AFM?

  a) Cantilever   b) Electrode   c) diode   d) knife

3. Atomic force microscopy (AFM) is also known as

  a) Scanning probe microscopy (SPM)

  b) Scanning Electron microscope (SEM)

  b) Electron microscope   d) none of the above

4. What is the general name for the class of structures made of rolled up carbon

  lattices?

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

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. Carbon atoms make_____type of bond with other carbon atoms

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

7. Sol-gel is _____ approach

  a) Bottom-up   b) Top-Down

  c) sputtering   d) chemical vapour deposition

8. The prefix nano comes form

  a) French word meaning billion   b) Greek word meaning dwarf

  c) Spanish word meaning particle   d) Latin word meaning invisible

9. The tensile strength of a carbon nanotube is _____ times that of steel.

  a)25   b)50   c)100   d)200

10. The most important property of nanomaterial is _____

  a) Force   b) Friction   c) Pressure   d) Temperature

SECTION – B

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

11. What is nanotechnology?

12. What is bravasis lattice?

13. List out the physical and chemical properties of nanomaterial.

14. What is nanocomposite?

15. Name the seven-crystal system.

16. What are the different synthesis methods of nanomaterial?

17. Name some characterization techniques used for nanomaterials.

SECTION – C

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

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

   nanotechnology.

[OR]

  b) Explain about Electrodeposition method.

19. a) Illustrate the structural properties using X-Ray diffraction.

[OR]

  b) Discuss briefly about the crystal structures of a material.

20. a) Explain about the sol gel process in detail.

[OR]

  b) Explain the working function of AFM.

SECTION – D

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

21. Write down about any two crystal strctures and its properties.

22. Determine the preaprtion of naoparticle by Spray pyrolysis method.

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 2022
Part – IV: Skill Based Courses: Sixth Semester: Paper – II
PHYSICS FOR COMPETITIVE EXAMINATIONS
Under CBCS and LOCF – Credit 2

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

SECTION – A

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

1. The dimensions of a couple are

   a) ML^2T^{-2} b) MLT^{-2} c) $ML^{-1}T^{-3}$ d) $ML^{-2}T^{-2}$

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) ¼ 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 energy and momentum of a photon are given by E=hν 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 6.4×10^{14} Hz. Its energy in eV will be (h=6.6×10^{-34} J-sec)

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

21. When a soap film (or oil film) on water is observed in daylight, it exhibits beautiful colours due to

a) interference   b) dispersion

c) reflection   d) refraction

22. In Young's two slits interference experiment if the distance between the

silts is made 3fold, the fringe width becomes

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

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 Ω, 4 Ω and 6 Ω 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) $n^2 R$

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) be unpredictable

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) See beck effect

c) Thomson effect

d) none of the above

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) none of the above

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 X 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 exists 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) $\sqrt{6} : \sqrt{3} : \sqrt{4}$
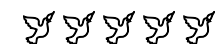
73. Stars radiate light of their own because of

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 & NOT gates

d) none of the above

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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. Physics Degree (Semester) Examinations, April 2022
Part – IV: Skill Based Courses: Sixth Semester: Paper – III
MEDICAL INSTRUMENTATION
Under CBCS and LOCF – Credit 2

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

SECTION – A

Answer ALL Questions   (10 × 1 = 10)

1. Physiological parameters of our biological systems are

  a) temperature   b) velocity of blood flow

  c) blood pressure   d) all the above

2. Bio-Medical instrument must have

  a) high precision   b) good calibration

  c) accurate output   d) all the above

3. Which one of the following is called "cardiac pacemaker"?

  a) Atrio-ventricular node   b) Sino Atrial node

  c) Purkinjie fibres   d) none of the above

4. The universally adopted ECG lead colour for Right leg is

  a) Brown   b) Green   c) Red   d) Yellow

5. Maximum amplitude of R wave is _____

  a) 0.25 mV   b) 1.60 mV   c) 0.5 mV   d) 0.1 mV

6. On the surface of the brain, the voltage is about

  a) 10 μV   b) 100 μV   c) 10 mV   d) 100 mV

7. _____ is a symptom for brain damage.

  a) Tumor   b) Brain death   c) Epilepsy   d) none of the above

8. Advantage of Ventilator treatment are

 a) adequate ventilation   b) elimination of respiratory work

 c) increased intrathoracic pressure   d) all the above

9. Antiparticle of positron is

 a) Proton   b) Electron   c) Fermion   d) Boson

10. Waves used in MRI is

 a) Microwaves b) Infrared   c) Radio waves   d) X-rays

SECTION – B

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

11. Define linearity.

12. What is the amplitude of QRS complex in ECG wave?

13. Draw Einthoven triangle.

14. What is called Epilepsy?

15. What is the frequency of Beta waves?

16. Write down the combination used in anesthetic Nitrous oxide.

17. Give any two advantages of Laser surgery.

SECTION – C

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

18. a) With the help of block diagram, write about components of Bio-
     medical instrument system.

                    [OR]

 b) Narrate the physiological process of electrical conduction system of

 heart and hence draw a typical ECG wave.

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

                    [OR]

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

20. a) Draw the block diagram of an anesthesia machine and explain.

                    [OR]

 b) Explain basic principle of Laser action.

SECTION – D

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

21. Explain Bipolar Limb Leads with neat diagram.

22. With neat diagram, explain ECG recording setup.

23. Describe the working of Ventilator Unit with its accessories.

24. Explain MRI system with block diagram.

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B.A., B.Sc., B.Com. & B.Com.(CA) Degree (Semester) Examinations, April 2022
HOUSE WIRING-II
Time: **2** Hours   **CERTIFICATE COURSES**   Max. Marks: **50**

SECTION – A

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

1. What is A.C?
2. What is DC?
3. Name the electrolyte used in the lead acid cell.
4. What is multimeter?
5. What is the composition of fuse wire?
6. What is LED?
7. What is MCB?
8. List out the types of transformers.
9. What are the colours used in three phase supply?
10. What is the use of soldering rod?

SECTION – B

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

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

[OR]

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

12. a) Draw the symbols for i)Cell   ii) Battery iii) Earth iv) Transformer v) Resistance

[OR]

b) Classify the different types of switches used in our daily life.

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

[OR]

b) Explain about the functions of transformer.

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

[OR]

b) Explain how to use soldering iron rod?

SECTION – C

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

15. Explain how to connect the wires in switch board.
16. Explain the parts and functions of ceiling fan.
17. Explain about the parts and functions of iron box.

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[Affiliated to Madurai Kamaraj University]
B.A. & B.Sc. Degree (Semester) Examinations, April 2022
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 Honour for President of India is

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

2. The word of command thaine muris meaning of

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

3. Sequence of fire control order is

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

4. In MR, Green colour represents

  a) Reserved forest   b) Cultivated area

  c) living area   d) dry river

5. Cadets stand side by side 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) 20 rounds/min

  c) 20 rounds/min   d) 20 rounds/min

7. A sudden attack on the enemy which is either taking rest or moving is called.

  a) ambush   b) Patrol

  c) sentry   d) concealment

8. For NCC training, the obstacle course consists of

   a) 10 obstacle   b) 12 obstacles

   c) 15 obstacle   d) 5 obstacles

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) Trans receiver

SECTION – B

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

11. Write the parts of word of command

12. What is civil defence?

13. What are the types of north?

14. Draw the conventional sign and military symbols of i) fort   ii) Platoon

15. What is the meaning of patrol?

16. Write the uses of service protector.

17. Define the term "vissarjan".

SECTION – C

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

18. a) Write the five aims of Drill

                [OR]

   b) Explain the functions of 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. Explain the different obstacle training.

22. Describe the Characteristics of 0.22" deluxe rifle.

23. Explain the different methods of communication.

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

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