VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]
B.Sc. Mathematics/Chemistry Degree (Semester) Examinations, April 2018
Part – III : Allied Subject : Second Semester : Paper – II

ALLIED PHYSICS II
Under CBCS – Credit 4

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

SECTION – A

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

1. The fringes formed in thin films are based on the phenomena of
   a) polarisation b) interference c) reflection d) refraction
2. Zeeman effect can be explained by
   a) Spin motion of electron b) orbital motion of electron
   c) Spatial quantization concept d) Elliptical orbital motion
3. 1 amu is equal to
   a) 931.5 ev b) 931.5 J c) 931.5 MeV d) 931.5 meV
4. Which of the following is correct
   a) $l = l_0\sqrt{1-\frac{v^2}{c^2}}$ b) $l = \frac{l_0}{\sqrt{1-\frac{c^2}{v^2}}}$ c) $l = l_0\sqrt{1-\frac{c^2}{v^2}}$ d) $l_0 = l$
5. A+AB = _____.
   a) 1 b) 0 c) AB d) A
6. What are the types of polarised waves?
7. What is Bohr magnetron?
8. Give any two differences between nuclear fission and fusion.
9. Give the postulates of special theory of relativity.
10. Write the truth table of AND gate.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Explain the construction and theory of plane diffraction grating. **(OR)**

    b) A parallel beam of sodium light of wave length 5890 A° is incident on a thin glass plate of refractive index n = 1.5 such that the angle of refraction info the plate is 60°. Calculate the smallest thickness of the plate which will make it appear dark by reflection.

12. a) Explain the quantum numbers associated with Vector atom model. **(OR)**

    b) Calculate the value of e/m of an electron. Given $M_B = 9.21 \times 10^{-24}$ units and h = 6.64×10^{-34} Js

13. a) Explain the construction and working of a ionization chamber. **(OR)**

    b) Calculate the binding energy per nucleon in $_6c^{12}$. The mass of $_6c^{12}$ = 12 u, mass of proton = 1.007276 u, mass of neutron = 1.008665 u and mass of electron = 0.00055 u.

14. a) Derive Lorentz transformation equations.

    (OR)

    b) A particle with a life time of 1 μs moves through the laboratory at 2.7×10^8 m/s. What is its life time as measured by observers in the laboratory? What will be the distance traversed by it before disintegrating?

15. a) Explain the construction and working of LED.

    (OR)

    b) State and prove De Morgan's theorem.

SECTION – C

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

16. Describe the construction of Laurent's half shade polarimeter and its working.
17. Describe the Stern and Gerlach experiment and discuss the results obtained.
18. With neat diagram explain the construction and working of a nuclear reactor.
19. Obtain the expression for mass energy equivalence.
20. Prove the universal property of a NAND gate.

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B.Sc. Physics Degree (Semester) Examinations, April 2018
Part – III : Core Subject : Second Semester : Paper – I

THERMODYNAMICS AND STATISTICAL MECHANICS
Under CBCS – Credit 4

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

SECTION – A

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

1. Under the steady state, the temperature of body:
   a) increases with time b) decreases with time
   c) does not change with time and is same at all points of the body
   d) does not change with time and can be different at different points of the body
2. According to Van der Waal's gas equation, critical coefficient $\frac{RT_C}{P_C V_C}$ is equal to
   a) 8 b) 8/3 c) 8.3 d) 1
3. The efficiency of Carnot engine working between steam point and ice point is
   a) 1 b) 0 c) 26.81% d) 16.81%
4. The thermodynamic probability of a system in equilibrium is
   a) maximum b) minimum but not 1 c) 1 d) zero
5. According to which statistics, the energy at absolute zero cannot be zero
   a) M-B b) B-E c) F-D d) None of the above
6. State Stefan's law.
7. Define Critical temperature.
8. State Zeroth law of Thermodynamics.
9. Define Phase space.
10. Write the two Postulates of Bose-Einstein distribution law.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Define Co-efficient of thermal conductivity and temperature gradient and Give its dimension.

(OR)

b) A bar of length 30 cm and uniform area of cross section 5 cm^2 consists of two halves AB of copper and BC of iron welded together at B. The end A is maintained at 200^0C and the end C at 0^0C. The sides of the bar are thermally insulated. Find the rate of flow of heat along the bar when the steady state is reached. Thermal conductivity of copper is 0.9 and thermal conductivity of iron is 0.12 CGS units.

12. a) Derive an expression of Newton's law of cooling from Stefan's law. **(OR)**

b) Calculate the Van der Waal's constants for dry air, given that T_c = 132 K, P_c = 37.2 atmospheres and R per mole = 82.07 cm^3 atmos K^{-1}.

13. a) State and Explain First Law of Thermodynamics.

(OR)

b) A Carnot's engine whose lower temperature heat sink is at 27^0C has its efficiency 40%. What is the temperature of the heat sources. By how much should the temperature of the source be raised if the efficiency is to be raised to 70%.

14. a) Define Position and Momentum Space.

(OR)

b) Explain Maxwell- Boltzmann Energy Distribution Law.

15. a) Explain about Phonon Gas.

(OR)

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

SECTION – C

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

16. Explain the distribution of energy in Black body Spectrum.
17. Describe the porous plug experiment. What conclusions have been drawn from it? What is inversion temperature?
18. Define Adiabatic process. Derive An Adiabatic Equation of a Perfect Gas.
19. State and Derive the Equipartion of Energy.
20. Compare M-B, B-E and F-D Statistics.

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B.Sc. Physics Degree (Semester) Examinations, April 2018
Part – III : Core Subject : Second Semester : Paper – II

OPTICS AND SOUND
Under CBCS – Credit 4

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

SECTION – A

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

1. The separation between adjacent maxima in interference pattern is
   a) $\frac{\lambda D}{d}$ b) $\frac{\lambda d}{D}$ c) $\frac{D}{\lambda d}$ d) $\frac{d}{\lambda D}$
2. Diffraction based on the wave theory was explained by
   a) Fresnel b) Fraunhofer c) Thomas Young d) Bragg
3. Optically isotropic materials are
   a) liquids b) amorphous solids
   c) crystalline solids with cubic symmetry
   d) all the above
4. The average acceleration in one time period in a simple harmonic motion is
   a) $A\omega^2$ b) $A\omega^2/2$ c) $A\omega$ d) zero
5. In travelling sound waves, which among the following parameter is in phase with the velocity of sound wave?
   a) 45^0 b) 90^0 c) 120^0 d) 135^0
6. Define Coherence.
7. Define Fraunhofer diffraction.
8. Define Polarization.
9. Define Resonance.
10. Define Longitudinal Waves.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

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

(OR)

b) Green light of wave light 5100 Å from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen 200 cm away is 2 cm. Find the slit separation.

12. a) Derive the formula for the minima in the single slit diffraction. **(OR)**

b) How many orders will be visible if the wavelength of the incident radiation is 5000 Å and the number of lines on the grating is 2620 in one inch.

13. a) Scattering of light leads to polarization. Justify?

(OR)

b) Two polarizing sheets have their polarizing directions parallel so that the intensity I_m of the transmitted light is a maximum. Through what angle must either sheet be turned if the intensity to drop by one-half?

14. a) Derive the period of oscillations of a Torsional Oscillator.

(OR)

b) A particle executing SHM has angular frequency 6.28 s^{-1} and amplitude 10 cm. Find (a) the time period (b) the maximum speed (c) the maximum acceleration (d) the speed when the displacement is 6 cm from the mean position and (e) the speed at t = $1/6^{th}$ sec assuming that the motion starts from rest at t = 0.

15. a) Describe the theory of interference in sound waves.

(OR)

b) An aero plane 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?

SECTION – C

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

16. Explain the working principle of Michelson's interferometer. Also how to measure the changes in the length by means of interference fringes.
17. Explain the theory of double slit interference and diffraction combined.
18. How do you produce a circularly polarized wave?
19. Derive the displacement, velocity and acceleration of a particle executing Simple Harmonic Motion.
20. What happens when sound waves get reflected and travels back in the opposite direction?

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B.Sc. Physics Degree (Semester) Examinations, April 2018

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

ANALOG ELECTRONICS

Under CBCS – Credit 5

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

SECTION – A

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

1. The ripple factor of a half-wave rectifier is

   a) 2 b) 1.21 c) 2.5 d) 0.48

2. The output impedance of a transistor is

   a) High b) zero c) low d) very low

3. The point of intersection of d.c. and a.c. load lines is called

   a) Saturation point b) cut off point

   c) operating point d) none of the above

4. An oscillator differs 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

5. In a radio receiver, we generally use _____ oscillator as a local oscillator.

   a) crystal b) Wien-bridg c) phase-shift d) Hartley

6. What is filter circuit?
7. Write any two advantages of JFET.
8. What do you understand by transistor biasing?
9. Write a note on piezo electric crystals.
10. What is mean by modulation?

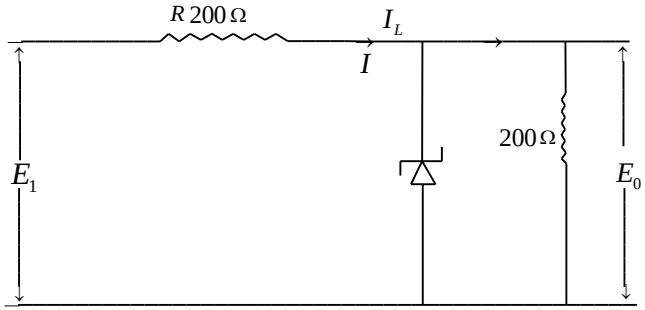
SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) What is a zener diode? Draw the equivalent circuit of an ideal zener in the breakdown region.

(OR)

b) Over what range of input voltage will the zener circuit shown in Fig. Maintain 30 V across 2000 Ω load, assuming that series resistance R = 200 Ω and zener current rating is 25 mA?



12. a) Explain the construction and working of a JFET. Also write the difference between a JFET and a bipolar transistor?

(OR)

b) For a single stage transistor amplifier, the collector load is RC = 2k Ω and the input resistance Ri = 1k Ω. If the current gain is 50, calculate the voltage gain of the amplifier.

13. a) Explain transistor RC coupled amplifier with special reference to frequency response.

(OR)

b) A transistor uses potential divider method of biasing. R1 = 50k Ω, R2 = 10k Ω and R_E = 1k Ω. If V_{CC} = 12V, find:
i) the value of IC; given V_{BE} = 0.1 V
ii) the value of IC; given V_{BE} = 0.3 V. Comment on the result.

14. a) What is an operational amplifier? Explain how it is used as an integrator and differentiator.

(OR)

b) The ac equivalent circuit of a crystal has these values: L = 1H, C = 0.01 pF, R = 1000 Ω and Cm = 20 pF. Calculate fs and fp of the crystal.

15. a) Derive an expression for the fraction of total power carried by the sidebands in amplitude modulation. What are the limitations of amplitude modulation?

(OR)

b) A frequency modulated voltage wave is given by the equation: $e = 12 \cos (6 \times 10^8 t + 5\sin 1250 t)$
Find (i) carrier frequency (ii) signal frequency
(iii) modulation index (iv) maximum frequency deviation
(v) power dissipated by the FM wave in 10 ohm resistor.

SECTION – C

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

16. With a neat sketch, explain the working of full-wave bridge rectifier and also derive an expression for the efficiency for a full-wave rectifier.
17. Describe about the performances of transistor amplifier.
18. Write short notes on the following:
i) phase reversal (ii) d.c. and a.c. load lines
iii) operating point (iv) classification of amplifiers.
19. With a neat diagram, explain the action of Hartley and Colpitt's oscillators.
20. What is superhetrodyne principle? Explain the function of each stage of superhetrodyne receiver with the help of a block diagram.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc. Physics Degree (Semester) Examinations, April 2018

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

MATHEMATICAL PHYSICS

Under CBCS – Credit 4

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

SECTION – A

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

1. The gradient of scalar field is always
   a) Scalar b) a Vector c) a numeric
   d) sometimes a scalar and a vector
2. $f(x) = 2x^3 - 9x^2 + 12x + 6$ is a polynomial of degree
   a) two b) three c) one d) four
3. In Gauss-Elimination method the given matrix is converted in to
   a) Unit Matrix b) Upper triangular matrix
   c) null matrix d) lower triangular matrix
4. Which among the following is correct
   a) $E = 1 + \Delta$ b) $E = 1 - \Delta$ c) $E = \Delta$ d) $E = \Delta - 1$
5. If we put n = 3 in Newton-cote's formula we get
   a) Trapezoidal rule b) Simpson's one – third rule
   c) Simpson's three-eighth rule d) Romberg method
6. State Cayley – Hamilton theorem.
7. Give an example for transcendental equations.
8. What are the two methods used in solving simultaneous linear algebraic equations?
9. Write Gauss – forward interpolation formula in tabular form.
10. What is the necessary condition to apply Simpson's one-third rule?

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Check whether the vectors $12\vec{i}+4\vec{j}-6\vec{k}$ is parallel or perpendicular to vector $6\vec{i}+2\vec{j}-3\vec{k}$.

(OR)

b) Prove that $\nabla r^n = nr^{n-2}r$.

12. a) Find the positive root of $Xe^X = 2$ by the method of false position.

(OR)

b) Find the roots of the equation $x^3+x^2-1=0$ by iteration method.

13. a) Solve the system of equations by Gauss – Seidel method

$x+y+54z=110$

$27x+6y-z=85$

$6x+15y+2z=72$ **(OR)**

b) Solve by Gauss – Elimination method

$3x+4y+5z=18$

$2x-y+8z=13$

$5x-2y+7z=20$

14. a) From the following table of half – yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 46 and 63.

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

(OR)

b) Find a polynomial of degree two which takes the values

x	0	1	3	4	5	6	7
y	1	2	7	11	16	22	29

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

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) A river is 80 m wide. The depth d in meter at a distance 'x' metres from one bank is given by the following table. Calculate the area of cross section of the river using Simpson's rule.

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

SECTION – C

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

16. Find the Eigen values and Eigen vectors of $A=\begin{bmatrix}\cos\theta & -\sin\theta \\ \sin\theta & \cos\theta\end{bmatrix}$

17. Find the real positive root of $3x-\cos x-1=0$ by Newton's method.

18. Solve by Gauss – Elimination method

$x-y+z=1$

$-3x+2y-3z=-6$

$2x-5y+4z=5$

19. Derive Gregory – Newton forward interpolation formula.

20. Evaluate the integral $I=\int_4^{5.2}\log_e x\,dx$ using Trapezoidal and Simpson's rules.

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B.Sc. Physics Degree (Semester) Examinations, April 2018
Part – III : Core Subject : Sixth Semester : Paper – I

NUCLEAR PHYSICS
Under CBCS – Credit 4

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

SECTION – A

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

1. The radius R of a nucleus is given by
   a) $R = r_0 A^{-1/3}$ b) $R = r_0 A^{1/3}$ c) $R = r_0 A^3$ d) $R = r_0 / A^3$
2. The decay chain of the nucleus $_{92}U^{238}$ involves eight α - decays and six β decays. The final nucleus at the end of the process will have
   a) Z = 82, A = 206 b) Z = 84, A = 224
   c) Z = 88, A = 206 d) Z = 76, A = 200
3. The minimum K.E. which the projectile should posses so that the nuclear reactions may take place is called
   a) Potential energy b) threshold energy
   c) thermal energy d) solar energy
4. Fusion reaction takes place at higher temperature because
   a) Atoms are ionized at higher temperature
   b) molecule break up at higher temperature
   c) Nuclei break up at high temperature
   d) K.E. is high enough to overcome repulsion between nuclei
5. Force that acts on both quarks and leptons is
   a) Strong nuclear force b) weak interaction
   c) intermediate interaction d) nuclear force
6. Define packing fraction.
7. Define mean life.
8. What do you mean by radio carbon dating?
9. Write a note on Fast Breeder reactor.
10. State Hubble's law.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) What is the difference between cyclotron and a synchrocyclotron? Explain the theory and principle of working of a synchro-cyclotron. **(OR)**
    b) Give the following isotope masses:
    $_3Li^7$ = 7.016004, $_3Li^6$ = 6.015125 and $_0n^1$ = 1.008665 amu
    Calculate the B.E. of a neutron in the $_3Li^7$ nucleus. Express the result in amu, MeV and joules.
12. a) Describe the experiment to determine the charge and range of alpha particle. **(OR)**
    b) 1 gram of radium is reduced by 2.1 mg in 5 years by α - decay. Calculate the half-life period of radium.
13. a) Write an essay on the artificial transmutation of elements.
    (OR)
    b) Write note on neutron sources and neutron detectors.
14. a) Explain how the nuclear energy is released from nuclear fission process. **(OR)**
    b) Write not on chain reaction and atom bomb.
15. a) Write a note on elementary particles.
    (OR)
    b) Write a note on thermal history of the universe.

SECTION – C

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

16. Describe liquid – drop model of the nucleus. How can the semi – empirical mass formula be derived from it? Mention the uses of this model.
17. Explain in detail about the neutrino theory of beta decay, internal conversion and law of radioactive disintegration.
18. Write a conscious account of the discovery, properties and uses of neutron.
19. Distinguish between nuclear fission and fusion. Describe the construction and working of a nuclear reactor. Mention some of its uses.
20. Describe the Quark model.

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B.Sc. Physics Degree (Semester) Examinations, April 2018
Part – III : Elective Subject : Sixth Semester : Paper – I

CLASSICAL MECHANICS, QUANTUM MECHANICS & THEORY OF RELATIVITY
Under CBCS – Credit 5

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

SECTION – A

Answer ALL Questions: (10 × 1 = 10)

1. Pendulum with variable length is a _____ constraint.
   a) holonomic b) dissipative c) bilateral d) rheonomic
2. The generalised momenta equation is
   a) $p_j = \frac{\partial L}{\partial \dot{q}_j}$ b) $p_j = \frac{\partial L}{\partial q_j}$ c) $q_j = \frac{\partial L}{\partial \dot{p}_j}$ d) $q_j = \frac{\partial L}{\partial p_j}$
3. Which of the following statement is correct
   a) de Broglie wavelength is always constant
   b) de Broglie wavelength is directly proportional to mass of the particle
   c) de Broglie wavelength is directly proportional to velocity
   d) de Broglie wavelength is inversely proportional to mass of particle
4. The lowest value of energy of a harmonic oscillator is called as
   a) ground energy b) first excited energy
   c) zero point energy d) potential energy
5. When an object moves with the speed of light, its mass becomes
   a) zero b) infinity c) equal to one d) mass of proton
6. What are degrees of freedom?
7. What is phase space?
8. Define group velocity.
9. Write the expectation value of an operator P.
10. What is time dilation?

SECTION – B

Answer ALL Questions: (5 × 7 = 35)

11. a) Deduce Lagrange's equations of motion from Hamilton's principle. **(OR)**
    b) Derive the equation of simple harmonic motion using Lagrange's equation.
12. a) Deduce canonical equations from variational principle.
    (OR)
    b) Using Hamilton's equation, derive the equation of motion of a simple pendulum.
13. a) Write a note on photoelectric effect.
    (OR)
    b) If an electron is in a one dimensional box of side 0.10nm, find its permitted energies of the first three energy levels.
14. a) Derive schrodinger's time dependent wave equation.
    (OR)
    b) Evaluate the eigen values and eigen function of a particle in an one dimensional box.
15. a) Obtain the Lorentz transformation equations.
    (OR)
    b) Find the rest energy of an electron by deriving the mass energy equivalence.

SECTION – C

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

16. i) Explain the concept of conservation of energy. (5 marks)
    ii) Deduce Hamilton's principle from D'Alembert's principle. (5 marks)
17. i) Obtain Hamilton's canonical equations of motion. (6 marks)
    ii) Give the physical significance of H. (4 marks)
18. What is Compton Effect? Derive expression for Compton shift in wavelength.
19. Deduce schrodinger equation for a harmonic oscillator and hence find the energy values and wave functions.
20. Describe Michelson-Morley experiment and explain the negative result obtained in the experiment.

06NE21

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.A./B.Sc./B. Com. Degree (Semester) Examinations, April 2018

Part – IV : NME subject : Second Semester : Paper – I

ELECTRICAL HOME APPLIANCES

Under CBCS – Credit: 2

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

SECTION – A

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

1. A Power supply is a device that supplies _____ energy to one or more electric loads.
   a) electrical b) chemical c) mechanical d) sound
2. The frequency of AC supply is
   a) 60 Hz b) 40 Hz c) 50 Hz d) 70 Hz
3. The term CFL stands for
   a) Compact Fluorescent Lamp b) Common Fluorescent Lamp
   c) Computer Fluorescent d) Common Filament Lamp
4. An electric heater is an electrical appliance that converts electrical energy in to
   a) sound b) light c) heat d) all the above
5. The normal human body temperature is
   a) 36.5°C b) 39.0 °C c) 40.0 °C d) 36.9°C

Give Short Answer:

6. What is power supply?
7. Write any two points about D.C. supply?
8. What is A.C. adopter?
9. Give any two advantages of LED.
10. Define the term electric heaters.

SECTION – B

Answer ALL Questions: **(4 × 10 = 40)**

11. a) Explain the single phase and two phase power supply.

(OR)

b) Differentiate between A.C and D.C. supply.

12. a) Discuss about the construction and working of a transformer.

(OR)

b) Explain the construction and working of a Incandescent Lamp.

13. a) Describe the Compact Fluorescent Lamp with a neat sketch

(OR)

b) Briefly the role of seven segment display.

14. a) Explain the function of instant water heater and immersion rod heater.

(OR)

b) Write a detailed note on electric fan.

SECTION – C

Answer any TWO Questions: **(2×12½ =25)**

15. Why is earthing done? What are the two systems of earthing? Explain how they are done.
16. Discuss about the construction, working principle of the sodium vapour lamp.
17. Explain the parts and working principle of an electric iron box with a neat diagram.

06SB41

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2018

Part – IV : Skill based subject : Fourth Semester : Paper – I

ASTROPHYSICS

Under CBCS – Credit: 2

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

SECTION – A

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

1. The nature of the stars can be detected through a telescope is _____
   a) Visual binary b) Spectroscopic binaries
   c) Spectrum binaries d) eclipsing binaries
2. Which of the following telescope being free from the effects of atmosphere can produce sharper images _____?
   a) Reflecting telescope b) Refracting telescope
   c) Radio telescope d) Hubble space telescope
3. Above the photosphere lies the second major layer of the solar atmosphere known as _____
   a) Troposphere b) Stratosphere
   c) Chromospheres d) ionosphere
4. The component of the space motion of a star, which is perpendicular to the line of sight, is
   a) V_r b) V_t c) V_c d) V_σ
5. The rays are high energy radiation mainly originating outside the solar system and even from distant galaxies.
   a) X-rays b) Cosmic rays c) Gamma rays d) UV rays

Give Short Answer:

6. What is Hubble Space telescope?
7. Define Zeeman Effect.
8. What is solar granulation?
9. Write down the methods is adopted to determine the distance of novae.
10. What is cosmology?

SECTION – B

Answer ALL Questions: **(4 × 10 = 40)**

11. a) Explain Radio telescope in detail.

(OR)

b) Give a brief account on stellar motions.

12. a) Write a short note on i) Photosphere & ii) Chromospheres.

(OR)

b) Explain Sunspots in detail.

13. a) Write down about the classification of stars.

(OR)

b) What is red shift? Discuss about the expansion of the universe.

14. a) Explain about the galaxy and its radiation.

(OR)

b) Write a short note on Supernovae.

SECTION – C

Answer any TWO Questions: **(2×12½ =25)**

15. Discuss about the different stages of light variation of novae.
16. Expalin Reflecting and refracting telescope.
17. Explain solar corona and its components.

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

(Autonomous & Residential)

[Affiliated to Madurai Kamaraj University]

B.Sc. Physics Degree (Semester) Examinations, April 2018

Part – IV : Skill based subject : Sixth Semester : Paper – I

OPTO ELECTRONICS - II

Under CBCS – Credit: 2

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

SECTION – A

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

1. The communication distance exceeds 10km better communication system is _____.
   a) Long – Haul b) LAN c) ADM d) video Link
2. Power splitting ratio of star coupler is
   a) -10 log (1/n) b) -10 log (P_{to}/P_{in})
   c) P_{to}/P_{in} d) None of these
3. Numerical aperture value of the fibre produced by vapour deposition method is
   a) 0.2 b) 0.2 c) 0.25 d) 0.3
4. The unit of frequency response factor RC is
   a) 0 dB b) 0.2 dB c) 0.154 dB d) none of the above
5. The number of channels N_c is given by the equation in ADM is ____
   a) $4d_c\theta_c/\lambda$ b) $2d_c\theta_c/\lambda$ c) $4d_c\theta/\lambda_c$ d) $4d_c\theta_c/\lambda_c$

Give Short Answer:

6. What is simplex and duplex communication system?
7. How is an optical fibre fabricated?
8. What is the unit of attenuation?
9. Write down any two possible losses which are to be taken into consideration for design of a fibre optic receiver.
10. What is an inverse square loss?

SECTION – B

Answer ALL Questions: **(4 × 10 = 40)**

11. a) Explain external CVD technique with neat diagram.

(OR)

b) Explain the axial vapour deposition process.

12. a) Explain beam splitting directional coupler.

(OR)

b) What is coupler? Explain biconically tapered directional coupler with neat diagram.

13. a) Explain about the bending losses in Optical fibres.

(OR)

b) Write a short note on Multielement and phasil system.

14. a) Explain the transmitter of fibre optic communication.

(OR)

b) Explain the satellite link type of optical fibre communication.

SECTION – C

Answer any TWO Questions: **(2×12½ =25)**

15. Describe briefly about the three process of internal chemical vapour deposition method in optic fibre communication.
16. Discuss briefly about the various losses occurred in optical fibre.
17. Explain about the important applications of integrated optic fibre technology.

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B.Sc. Physics Degree (Semester) Examinations, April 2018

Part – IV : Skill based subject : Sixth Semester : Paper – II

PHYSICS FOR COMPETITIVE EXAM.

Under CBCS – Credit: 2

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

Answer ALL Questions: **(75 × 1 = 75)**

1. The unit of G in SI system is
   a) $Nm^{-2}kg^{-2}$ b) $Nm^{-2}s^{-2}$ c) Nms^{-2} d) $Nm^{2}kg^{-2}$
2. The dimensional formula for Planck's constant (h) is
   a) $[ML^{2}T^{-3}]$ b) $[ML^{2}T^{-2}]$ c) $[ML^{2}T^{-1}]$ d) $[ML^{-2}T^{-2}]$
3. If C and R denote capacity and resistance, the dimension of CR is
   a) $M^{0}\ L^{0}\ T^{1}$ b) $M^{1}L^{0}\ T^{1}$
   c) $M^{0}\ L^{0}\ T^{0}$ d) not expressible in terms of M LT
4. 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
5. In planetary motion
   a) the angular speed remains constant
   b) the angular momentum remains constant
   c) the linear speed remains constant
   d) the linear momentum remains constant
6. When two bodies collide elastically, then
   a) kinetic energy of the system alone is conserved
   b) only momentum is conserved
   c) both energy and momentum are conserved
   d) neither energy or momentum is conserved
7. 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
8. 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

9. A loaded spring vibrates with a period T. The spring is now divided into nine equal parts and the same load is suspended from one of these parts. The new period is
   a) T/3 b) T/9 c) 3T d) T

1. An ideal gas heat engine operates in a Carnot cycle between 227 ˚ C and 127 ˚ c) It absorbs

10. 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

11. 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

12. The thermodynamic process, in which temperature of the system remains constant, is called
    a) isothermal b) adiabatic c) isomeric d) isobaric

13. A perfect gas is compressed to 1/4 th of its original volume. The initial pressure of the gas is 1 atm. If the compression is isothermal, the final pressure will be
    a) 4 atm b) 1/4 atm c) 16 atm d) 1/16 atm

14. A body which absorbs all the radiations incident over it is called as
    a) good absorber b) good emitter
    c) good transmitter d) perfectly black body

15. Prof. S. N. Bose's contribution was to give
    a) A derivation of Kirchhoff's law
    b) A suggestion that bodies emit and absorb radiations at all temperatures
    c) A definition of black body
    d) A rigorous derivation of Planck law

16. Quantum nature of light is not supported by the phenomenon of
    a) Compton effect b) photoelectric effect
    c) emission or absorption spectrum d)

17. The energy and momentum of a photon are given by $E=h\nu$ and $P=h/\lambda$ respectively. Velocity of the photon will be
    a) EP b) E/P c) P/E d) E/P^2

18. 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

19. 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

20. 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

21. Rainbow is formed due to the phenomenon of
    a) Refraction and absorption b) dispersion and focusing
    c) refraction and scattering
    d) dispersion and total internal reflection

22. 1 Weber/m^2 is equal to
    a) 1 Gauss b) 10 Gauss c) 10^2 Gauss d) 10^4 Gauss

23. 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

24. 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

25. 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}

26. When the distance between two charged particles is halved, the force between them becomes
    a) one-forth b) one-half c) double d) four times

27. The magnitude of electric field intensity (strength) E is such that an electron placed in it would experience an electrical force equal to its weight is given by
    a) *mge* b) *mg/e* c) *e/mg* d) e^2g/m^2

28. Charges reside on the
    a) outer surface of the charged conductor
    b) inner surface of the charged conductor
    c) inner as well as outer surface of the charged conductor
    d) none of the above

29. 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

30. No current flows between two charged bodies when connected together, if they have
    a) the same charge b) the same capacitance
    c) the same potential d) none of the above

31. 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

32. 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

33. 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

34. In a Wheatstone bridge the resistances in the ratio arms are 100 Ω and 150 Ω respectively.
    If R= 80 Ω , the resistance of the fourth arm will be
    a) 120 Ω b) 80 Ω c) 150 Ω d) 70 Ω

35. The magnetic field at a point due to a current carrying conductor is directly proportional to
    a) resistance of the conductor b) thickness of the conductor
    c) current flowing through the conductor
    d) distance from the conductor

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. Which one of the following statements is wrong?
    a) A voltmeter should have high resistance
    b) An ammeter should have low resistance
    c) An ammeter is placed in parallel across the conductor and voltmeter in series in the circuit
    d) An ammeter is placed in series and voltmeter in parallel across the conductor in the circuit

38. 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

39. 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

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) none of the above

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) Seeback 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. The knowledge of electromagnetic induction has been used in the construction of
    a) electric motor b) generator c) voltmeter d) galvanometer

44. Which of the following phenomena is utilized 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

45. The particle accelerator that uses the phenomenon of e.m. induction is the
a) betatron b) cyclotron
c) Cockcroft-Walton generator d) Van de Graff generator

46. 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

47. 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

48. 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) $2\sqrt{2}\ E_{rms}$ c) $2/\sqrt{2}\ E_{rms}$ d) $E_{rms}/2$

49. 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

50. With high frequencies capacitive reactance
a) decreases b) increases
c) remains unchanged d) none of the above

51. A pure inductive coil is that which has
a) some ohmic resistance b) no impedance
c) no ohmic resistance d) none of the above

52. 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) $\tan^{-1}(0.2\pi)$

53. 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 pF b) 0.8 pF c) 85 pF d) 850 pF

54. In an LCR-series circuit R= $\sqrt{3}\ \Omega$, $X_L = 10\ \Omega$, $X_C = 11\ \Omega$, 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

55. 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

56. 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

57. 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

58. Bragg's equation will not have solution, if
a) $\lambda > 2d$ b) $\lambda < 2d$ c) $\lambda > d$ d) $\lambda = d$

59. An X-ray has a wavelength of 0.01 a) Its momentum is
a) 3.313 X 10^{-22} kg-m/sec b) 6.626 X 10^{-21} kg-m/sec
c) 3.456 X 10^{-25} kg-m/sec d) 2.126 X 10^{-22} kg-m/sec

60. The work function for photoelectric effect
a) depends upon the frequency of incident light
b) is same for all metals
c) is different for different metals d) none of the above

61. Work function of molybdenum is 5 eV. If ultraviolet light of wavelength 1000 A falls upon it the maximum velocity of the ejected photoelectrons will be
(Given : h = 6.6 X 10^{-34} J-s, e = 1.6 X 10^{-19} C , m = 9.1 X 10^{-31} Kg and 1 eV = 1.6 X 10^{-19} J)
a) 1.6 X 10^6 m/sec b) 1.6 X 10^4 m/sec
c) 1.6 X 10^5 m/sec d) 1.6 X 10^2 m/sec

62. An electron is accelerated through a potential difference of V volts. The de Broglie wavelength (λ) associated with the electron is
a) $\frac{12.27}{\sqrt{V}}$ A b) $\frac{12.27}{V}$ A c) $12.27\sqrt{V}$ A d) $\frac{1}{12.27\sqrt{V}}$ A

63. 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

64. An α – particle and a proton have the same kinetic energy. The ratio of their wavelengths is ($m_\alpha = m_p$)
    a) 1:2 b) 2:1 c) 1:4 d) 4:1

65. The de Broglie wavelength of a 1 KeV neutron is
    a) 9.04 X 10^{-3} A b) 9.04 X 10^{-5} A c) 9.04 A d) 0.904 A

66. If ΔX and ΔP are uncertainties in the measurement of position and momentum respectively, then according to Heisenberg uncertainty principle
    a) $\Delta X \Delta P \geq \hbar$ b) $\Delta X \Delta P \leq \hbar$ c) $\Delta X \Delta P > \hbar^2$ d) $\Delta X \Delta P < \hbar^2$

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

68. Thermionic emission is the phenomenon of
    a) emission of electrons b) emission of photons
    c) emission of neutrons d) emission of protons

69. The term transistor stands for
    a) transfer of resistance, i.e., the change of resistance
    b) transfer of voltage c) transfer of power
    d) none of the above

70. The ratio of atomic radius(r) and lattice parameter(a) of SC system is
    a) 2 b) ½ c) 1/2√2 d) $\sqrt{3/4}$

71. The coordination number for FCC system is
    a) 6 b)8 c) 4 d) 12

72. If *r* denotes the mean distance of a planet from the sun and *T* the time period of the planet, then
    a) $r \propto T^{2/3}$ b) $r \propto T^{3/2}$ c) $r \propto T^{1/3}$ d) $r \propto T$

73. Which of the following is not a sequential circuit?
    a) counter b) flip-flop c) multiplexer d) shift register

74. In Boolean algebra, the dot sign (.) indicates
    a) AND gate b) OR gate c) NOT gate d) NAND gate

75. The binary code of $(21.125)_{10}$ is
    a) 10100.001 b) 10101.001 c) 10101.010 d) 10100.100

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VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

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B.Sc. Physics Degree (Semester) Examinations, April 2018

Part – IV : Skill based subject : Sixth Semester : Paper – III

MEDICAL INSTRUMENTATION

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

SECTION – A

Answer ALL Questions: (10 × 1 = 10)

1. Any device converting one form of energy into another form is called
   a) amplifier b) oscillator c) rectifier d) transducer
2. The ability of an instrument to detect even a very small change in the input is called
   a) sensitivity b) linearity c) accuracy d) none of 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. Advantage of Ventilator treatment are
   a) adequate ventilation b) elimination of respiratory work
   c) increased intrathoracic pressure d) all the above
5. Biomedical applications of Lasers are
   a) Diagnosis b) Therapeutic c) Surgery d) All of the above
6. What is the ECG calibration signal amplitude?
7. What is the role of spirometer in ventilator?
8. List out the mixture of chemicals used as anesthetic.
9. Which is the anti-particle of Positron?
10. Name the radioisotope used in Gamma ray camera.

SECTION – B

Answer ALL Questions: (4 × 10 = 40)

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

(OR)

b) Explain about Bipolar Limb Leads system used in ECG.

12. a) Describe brain waves on the basis of frequency.

(OR)

b) Discuss about the placement of EEG electrodes with neat diagram.

13. a) Describe the working of Rotameter.

(OR)

b) Explain the principle of Laser action.

14. a) Describe the working of Gamma-ray camera.

(OR)

b) Explain Positron Emission Tomography.

SECTION – C

Answer any TWO Questions: (2×12½ =25)

15. Explain ECG recording setup with block diagram.
16. Describe the working of Ventilator Unit with its accessories.
17. Draw the block diagram of MRI system

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B.A./B.Sc./B. Com. Degree (Semester) Examinations, April 2018

Part – IV : NME subject : Second Semester : Paper – I

CIVIL DEFENCE AND ADVENTURE TRAINING

Under CBCS – 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
   a) 150 b) 100 c) 50 d) 125
2. The word of command for THAM finishes on _____foot in marching
   a) left b) right c) left or right d) none of these
3. Sequence of firing is
   a) HAT b) ATH c) HTA d) AHT
4. In MR, Green 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

Give Short Answer:

6. Define Northing in MR.
7. Write any two characteristics of 0.22 rifle.
8. Write the three types of north.
9. Expand the term WT:
10. Expand the term MR:

SECTION – B

Answer ALL Questions: (4 × 10 = 40)

11. a) Write the five aims of Drill.

(OR)

b) What are the types of adventure training?

12. a) Define the following terms: (i) Rank and (ii) File (iii) blank file.

(OR)

b) What are the basic requirements of good firer?

13. a) Explain the different types of section formation.

(OR)

b) Differentiate between 'line tor' and 'vissarjan'.

14. a) Explain the functions of Civil defence.

(OR)

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

SECTION – C

Answer any TWO Questions: (2×12½ =25)

15. Explain the different types of judging distance in field graft.
16. Explain the different types of fire control order.
17. What is a Map? Explain the map readings.