



K19U 0133

Reg. No. :

Name :

VI Semester B.Sc. Degree (CBCSS-Reg./Supple./Improv.) Examination,
April 2019

(2014 Admission Onwards)
CORE COURSE IN PHYSICS
6B11PHY : Electrodynamics – II

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all** questions (very short answer type, **each** question carries **1** mark).

1. After removing _____, Ferromagnetic materials retain their magnetism.
2. S.I. unit of inductance is
3. Write an expression for displacement of sinusoidal waves.
4. Betatron are used to accelerate

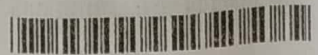
SECTION – B

Answer **any seven** questions (short answer type, **each** question carries **2** marks).

5. Derive the relation connecting magnetic field (H) and magnetic flux density (B).
6. For uniformly magnetized materials volume current density is zero. Why ?
7. Define Poynting theorem.
8. Discuss Faradays law of electromagnetic induction.
9. Write boundary conditions in electrodynamics.
10. Derive continuity equation.

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11. Write d' Alembertian operator. In static conditions how it reduces ?
12. What are plane of polarization and plane of vibration ?
13. Describe the concepts of auto transformer.
14. What is Hall effect ?

SECTION – C

Answer **any four** questions (short essay/problem type, **each** question carries **3** marks).

15. Describe the effect of magnetic field on Atomic orbital.
16. A long copper wire of radius 2 mm carries a uniformly distributed free current 2 mA. Find magnitude and direction of H at a loop of radius 1 mm inside the wire.
17. How Maxwell modified Ampere's circuital law ?
18. Find self inductance per unit length of a solenoid of radius R, carrying N number of turns per unit length.
19. Derive a relation between refractive index and dielectric constant. Find dielectric constant of water for visible light.
20. Find angular frequency of proton of mass 1.667×10^{-27} kg through the cyclotron with a magnetic field of 2T.

SECTION – D

Answer **any two** questions (long essay type, **each** question carries **5** marks).

21. Describe :
 - 1) Ferromagnetism
 - 2) Hysteresis loop
 - 3) Curie point
 22. Explain Maxwell's equations in matter.
 23. Show that direction of E, B and direction of propagation of electromagnetic waves are mutually perpendicular to each other.
 24. Explain the working principle of electrostatic generator and cyclotron.
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Examination, April 2019
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Core Course in Physics
6B12 PHY : PHOTONICS AND SPECTROSCOPY

Time : 3 Hours

Max. Marks : 40

Instructions : Write answers in **English** only.

SECTION – A

Answer **all** – Very short answer type – **Each** question carries **one** mark.

1. The basic principle involved in lasing action is _____
2. Optical fibers can carry optical frequencies of about _____
3. The basic technique in holography is _____
4. The rotational spectroscopy is in the region of _____

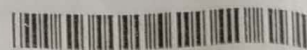
SECTION – B

Answer **any seven** – Short Answer Type. **Each** question carries **two** marks.

5. What are the essential components of a laser ? Explain their functions.
6. Give the necessity of cladding in the optical fiber.
7. Mention any four applications of optical fiber.
8. Briefly explain collision broadening. ✓
9. What is a linear molecule ? Give an example.
10. What is population inversion ? ✓
11. What are hot bands ? Why they are called so ?
12. What is Born-Oppenheimer approximation ?
13. Briefly explain how hologram is constructed.
14. Explain the principle of working of a microwave oven.

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SECTION – C

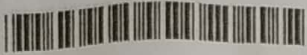
Answer **any four** – Short essay/problem type – **Each** question carries **three** marks.

15. Calculate the angle of acceptance of a given optical fiber, if the refractive indices of the core and cladding are 1.563 and 1.498 respectively.
16. The average spacing between successive rotational line of carbon monoxide is 3.8626 cm^{-1} . Determine the transition which gives the most intense spectral line at 300K.
17. The fundamental and first overtone transition of $^{14}\text{N}^{16}\text{O}$ are centered at 1876.06 cm^{-1} and 3724.2 cm^{-1} respectively. Evaluate the equilibrium vibration frequency, the anharmonicity constant and zero point energy.
18. Outline the effect of isotopic substitution on the rotational spectra of molecules.
19. Calculate the ratio of spontaneous emission to stimulated emission for radiation ⁵⁰⁰600 nm at ²⁰⁰⁰2500 K. Is lasing possible ?
20. In a ruby laser the ruby rod contain a total of 3×10^{19} chromium ions. If laser emits lights of 6943 \AA wavelength, find the energy of one emitted photon and the total energy available per laser.

SECTION – D

Answer **any two** – Long essay type – **Each** question carries **five** marks.

- ✓ 21. Explain with the help of an energy level diagram the working of a He-Ne laser.
22. Discuss the theory of vibrating diatomic molecule.
23. A) Deduce an expression for acceptance angle of an optical fiber.
B) Using ray theory, derive the condition for transmission of light in an optical fiber.
24. Discuss the theory of the origin of pure rotational spectrum of a diatomic molecule.



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CORE COURSE IN PHYSICS

6B13 PHY : Quantum Mechanics

Max. Marks : 40

Time : 3 Hours

SECTION – A

(Answer **all**. Very short answer type. **Each** question carries **one** mark.)

1. The Paschen series is the transition between the levels of _____
2. The momentum of matter wave is given by _____
3. The solution of Schrodinger equation of a free particle is _____
4. One dimensional harmonic oscillator has _____ degrees of freedom.

SECTION – B

(Answer **any seven**. Short answer type. **Each** question carries **two** marks.)

5. What is Compton Effect ?
6. List out any four inadequacies of quantum theory.
7. Consider the standing wave of an electron in an orbit and Bohr's quantization rule.
8. Prove the non-existence of electrons inside the nucleus on the basis of uncertainty principle.
9. What are Eigen functions and Eigen values of an operator ?
10. What is box normalization ? Explain with example.
11. Why does the spin of an electron play an important role in the structure of energy levels of a many electron atom but not in hydrogen atom ?
12. Explain de Broglie hypothesis. Why the wave nature of matter is not apparent in our daily observations ?

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13. Bring out the conclusions of Stern Gerlach experiment.
14. Briefly explain the mechanism by which photoelectrons are emitted.

SECTION – C

(Answer **any four**. Short essay/problem type. **Each** question carries **three** marks.)

15. Find the energy of an harmonic oscillator using quantization rule.
16. An X-ray photon of wavelength 0.3\AA is scattered through an angle 45° by a loosely bound electron. Find the wavelength of the scattered electron.
17. Find the Eigen functions and nature of Eigen values of the given operator.

$$\frac{d^2}{dx^2} + \frac{2d}{x dx}$$

18. A harmonic oscillator moves in a potential $V(x) = \frac{1}{2}kx^2 + cx$. Find the energy Eigen values.
19. 1 g marble is constrained to roll inside a tube of length 1 cm, the tube is capped on both sides. Modeling this as square well potential, determine the values of quantum numbers of the marbles. If the initial energy is 1.06 mJ, calculate the next excitation energy of marble.
20. Normalize the wave function $\Psi(x) = e^{\frac{-x}{a}}$.

SECTION – D

(Answer **any two**. Long essay type. **Each** question carries **five** marks.)

21. Explain the significance of Ehrenfest's theorem.
22. A) Explain the postulates of Bohr with regard to hydrogen atom.
B) Explain the photoelectric effect and also the concept of Einstein with regard to it.
23. Explain the different postulates of quantum mechanics in detail.
24. Solve the Schrodinger equation for linear harmonic oscillator using Schrodinger method.



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CORE COURSE IN PHYSICS
6B14PHY – Electronics – II

Time : 3 Hours

Max. Marks : 40

SECTION – A

(Answer **all**. Very short answer type. **Each** question carries **1** mark).

1. If the value of α is 0.9 then the value of β is
2. In a phase shift oscillator, the frequency is determined by
3. In a non inverting amplifier has $R_i = 10\text{ K}\Omega$ and $R_f = 100\text{ K}\Omega$, the closed loop voltage gain is
4. The inputs to a NOR gate is 000, the output will be

SECTION – B

(Answer **any seven**. Short answer type. **Each** question carries **two** marks).

5. What do you understand by hybrid parameters ? What are their dimensions ?
6. What is Barkhausencriterion ?
7. What is stabilisation of operating point ? What is its need ?
8. What is an op-amp ?
9. What are the three basic logic gates ?
10. Explain the function of class B power amplifiers.

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11. What do you mean by a comparator circuit ?
12. What is a QUAD in a karnaugh map?
13. What is meant by negative feedback ?
14. Draw the half adder circuit and its truth table.

SECTION – C

(Answer **any four**. Short essay/problem. **Each** question carries **three** marks).

15. The collector leakage current in a transistor is $250 \mu\text{A}$ in CE arrangement. If the transistor is connected in CB arrangement, what will be the leakage current ? (given $\beta = 100$).
16. Explain the principle of a summing OP-amp with the help of a diagram.
17. State and prove De-Morgan's theorems.
18. A certain amplifier has voltage gain of 15dB. If the input signal voltage is 0.8V, what is the output voltage.
19. Determine the operating frequency and feedback fraction for colpitt's oscillator. Given $C_1 = 0.001 \mu\text{F}$, $C_2 = 0.01 \mu\text{F}$, $L = 10 \mu\text{H}$.
20. Explain product of sum method with examples.

SECTION – D

(Answer **any two**. Long essay type. **Each** question carries **five** marks).

21. Explain the CE characteristic of a transistor with a neat diagram.
22. Discuss class A audio power amplifier. Also obtain an expression for efficiency.
23. Explain the working of an op-amp as integrator and differentiator.
24. Explain karnaugh map simplification with examples of pairs, quads and octets.

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Examination, April 2019

(2014 Admission Onwards)

CORE COURSE IN PHYSICS

6B15 PHY : (Elective – B) : Astronomy and Astrophysics

Time : 3 Hours

Max. Marks : 40

Instruction : Write answers in **English** only.

SECTION – A

Answer **all**. Very short answer type. **Each** question carries **one** mark.

1. Who introduced six color photometry system ?
2. The color index of sun is _____
3. Declination and right ascension are the two coordinates of _____ system.
4. Give an example of star having zero magnitude.

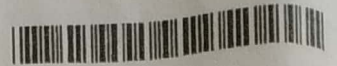
SECTION – B

Answer **any seven**. Short answer type. **Each** question carries **two** marks.

5. What are the quantities on which the brightness of a star depends on ?
6. Give period-luminosity law.
7. What is the relation between parsec and light year ?
8. What is meant by heat index of a star ?
9. What is meant by absorption spectra ?
10. What are cosmic rays ?

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✓ 11. Define the term distance modulus.

12. Describe Zenith and Nadir.

✓ 13. Explain Limb darkening.

14. Define Stellar parallax.

SECTION – C

Answer **any four**. Short essay/ problem type. **Each** question carries **three** marks.

✓ 15. Distinguish between absolute and apparent magnitude. Also obtain the relation between them.

✓ 16. What is Schwarzschild radius of a black hole ? Calculate the Schwarzschild radius of a star with 5 solar mass.

17. Explain angular magnification and resolving power.

18. Explain the origin of cosmic rays.

✓ 19. Explain how sun spots are formed.

✓ 20. Compare asteroids and meteorites.

SECTION – D

Answer **any two**. Long essay type. **Each** question carries **five** marks.

21. What are Galaxies ? Explain the origin and evolution of Galaxies. How are they classified ?

22. Explain the general properties and various aberrations of a telescope.

✓ 23. Discuss the Stellar positions and any two celestial co-ordinate system for describing the position of a heavenly object.

✓ 24. Give an account on the internal structure and atmosphere of sun.
