



K17U 0378

Reg. No.: .....

Name: .....

VI Semester B.Sc. Degree (CBCSS – Regular) Examination, May 2017  
Core Course in Physics  
(2014 Admn.)  
6B11 PHY : ELECTRODYNAMICS – II

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Total current density inside a magnetized material is the sum of \_\_\_\_\_
2. A time varying magnetic field induces \_\_\_\_\_
3. Write down continuity equation.
4. Give one example for electrostatic generator. (1×4=4)

SECTION – B

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

5. Prove that  $\nabla \times \mathbf{H} = \mathbf{J}_f$ .
6. Write down boundary condition for magneto static fields inside a matter.
7. Define self-inductance of a coil.
8. Write down four Maxwell's equations in electrodynamics.
9. Define Poynting theorem.
10. State and explain Ohm's law.
11. Write down possible waveform of sinusoidal wave.
12. Define polarization.

P.T.O.



13. What is the working principle of electrostatic voltmeter ?

14. How auto transformer differ from ordinary transformer ?

(2×7=14)

### SECTION – C

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

15. Write a note on ferromagnetism.

16. A long copper rod of radius  $R$  carries a uniform distributed free current  $I$ . Find  $H$  outside the rod.

✓ 17. How Maxwell modified Ampere's circuital law ?

18. For Silver, Hall coefficient is  $-0.84 \times 10^{-10} \text{ Vm}^3/\text{AWb}$ .

a) Write down the type of charge carriers in it.

b) What is the number density of charge carriers ?

✓ 19. Explain radiation pressure. What will be the radiation pressure of a perfect absorber, when sunlight of intensity  $1300 \text{ W/m}^2$  hit on it ?

20. Explain working of mass spectrometer and velocity selector.

(3×4=12)

### SECTION – D

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

21. What are bound currents ? Explain their physical significance.

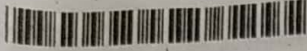
22. Explain electromagnetic boundary conditions.

✓ 23. Explain reflection and transmission of electromagnetic waves at normal incidence.

24. Explain theory and working of cyclotron.

(5×2=10)





K17U 0379

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VI Semester B.Sc. Degree (CBCSS – Regular) Examination, May 2017  
CORE COURSE IN PHYSICS  
6B12 PHY : Photonics and Spectroscopy  
(2014 Admn.)

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 :

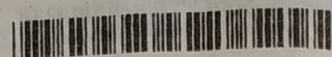
1. The angle of incidence for which the corresponding angle of refraction is  $90^\circ$  is called \_\_\_\_\_
2. The construction of hologram made use of the principle of \_\_\_\_\_
3. The separation between any two adjacent lines in a P branch or R branch is \_\_\_\_\_
4. In He-Ne laser population inversion is achieved by \_\_\_\_\_ (1×4=4)

SECTION – B

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

5. Discuss any two applications of holography.
6. Define numerical aperture. Deduce an expression for it.
7. What are the advantages of a hologram over ordinary photograph ?
8. Briefly explain how hologram is constructed.
9. What is meant by stimulated emission ? Explain with a two level diagram.
10. What are the essential components of a laser ? Explain their functions.
11. What are hot bands ? Why they called so ?

P.T.O.



- ✓12. Classify molecules according to their rotational spectra.
13. Explain the principle of working of a microwave oven.
14. Mention the advantages of optical fiber sensor over conventional sensors. (2×7=14)

## SECTION – C

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

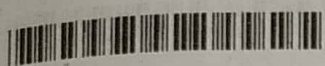
15. The average spacing between successive rotational line of carbon monoxide is  $3.8626 \text{ cm}^{-1}$ . Determine the transition which gives the most intense spectral line at 300 K.
16. The fundamental and first overtone transitions of  $^{14}\text{N}^{16}\text{O}$  are centred at  $1876.06 \text{ cm}^{-1}$  and  $3724.20 \text{ cm}^{-1}$  respectively. Evaluate the equilibrium vibrational frequency, the unharmonicity and the exact zero point energy.
17. The He-Ne system is capable of lasing at  $3.3913 \mu\text{m}$ . Determine the energy difference in eV between the upper and lower of this wavelength.
18. A fiber cable has an acceptance angle of  $30^\circ$  and a core index of refraction 1.4; calculate the refractive index of the cladding.
19. A step index fiber is made with core of refractive index 1.52, a diameter of  $29 \mu\text{m}$  and a fractional difference index of 0.0007 it is operated at a wavelength of  $1.3 \mu\text{m}$ . Find the V-number and the number of modes that the fiber will support.
20. At what temperature are the rates of spontaneous and stimulated emission equal ? Assume  $\lambda = 5000 \text{ \AA}$ . (3×4=12)

## SECTION – D

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

21. Explain the principle, construction and working of ruby laser with suitable diagram.
- ✓22. Describe the theory of diatomic vibrating rotator with energy level diagrams.
23. Discuss about the effect of isotopic substitution and intensity of spectral lines in rotational spectroscopy.
- ✓24. Briefly explain an optical fiber. Using ray theory discuss the mechanism of transmission of light within an optical fiber. (5×2=10)





K17U 0380

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VI Semester B.Sc. Degree (CBCSS – Regular) Examination, May 2017  
CORE COURSE IN PHYSICS

(2014 Admn.)

6B13 PHY : Quantum Mechanics

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Photoelectric current is directly proportional to the
2. Write down the time dependent Schrodinger equation for a particle of mass  $m$  moving in a potential  $v(r, t)$ .
3. The splitting of spectral lines by magnetic field is
4. For the Harmonic oscillator the levels are

(1×4=4)

SECTION – B

Answer **any seven**, short answer type, **each** question carries **two** marks.

5. Explain the postulates of Bohr with regard to hydrogen atom.
6. What is Compton effect ?
7. Explain de Broglie's hypothesis.
8. State and explain uncertainty principle.
9. What are eigen functions and eigen values of an operator ?
10. Distinguish between coordinate and momentum representation.

P.T.O.

K17U 0380



11. What does tunnelling mean ?
12. What is zero point energy of a harmonic oscillator ?
13. Sketch graphs of wave function  $\psi$  and of  $|\psi|^2$  for the  $n = 3$  and  $n = 4$  states of a particle trapped in a potential well of infinite depth.
14. State Pauli-exclusion principle. (2×7=14)

### SECTION – C

Answer **any four** short essay/problem, **each** question carries **three** marks.

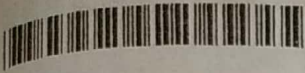
15. X-rays with  $\lambda = 1.0 \text{ \AA}$  are scattered from a metal block. The scattered radiation are viewed at  $90^\circ$  to the incident direction. Evaluate the Compton shift.
16. An electron has a speed of 500 m/s with an accuracy of 0.004%. Calculate the certainty with which we can locate the position of the electron.
17. Explain the significance of Ehrenfest's theorem.
18. Explain how barrier tunnelling accounts for  $\alpha$ -decay by certain nuclei.
19. Find the expectation value  $\langle x \rangle$  of the position of a particle trapped in a box  $L$  wide.
20. A sample of a certain element is placed in a 0.300 T magnetic field and suitably excited. How far apart are the Zeeman components of the 450 nm spectral line of this element ? (3×4=12)

### SECTION – D

Answer **any two** long essay type, **each** question carries **five** marks.

21. Give an account of Einstein's explanation of photoelectric effect on the basis of quantum theory.
22. Explain quantum mechanical tunneling.
23. State and explain the postulates of quantum mechanics.
24. Discuss Zeeman effect. (5×2=10)





K17U 0381

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VI Semester B.Sc. Degree (CBCSS – Regular) Examination, May 2017  
CORE COURSE IN PHYSICS  
(2014 Admn.)  
6B14 PHY : Electronics – II

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all**-very short answer type – **Each** question carries **1** mark.

1. The purpose of coupling capacitor in a transistor amplifier is to .....
2. An oscillator converts .....
3. The gain of an ideal Op-amp is .....
4. De Morgan's first theorem says that a NOR gate is equivalent to a .....  
(1×4=4)

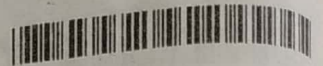
SECTION – B

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

5. What is meant by band-width ?
6. What is Barkhausen criterion ?
7. Why is amplifier circuit necessary in an oscillator ?
8. What is an Op-amp ?
9. Discuss the operation of a summing amplifier.
10. What are the three basic logic gates ?
11. What are encoders and decoders ?
12. What is a QUAD in a karnaugh map ?
13. Sketch the common emitter output characteristics of a BJT.
14. Draw a full adder and its truth table.

(2×7=14)

P.T.O.



## SECTION – C

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

15. If the amplifier is to operate over a frequency range from 2 KHz to 10 KHz. Select a suitable value for the emitter bypass capacitor ? Given  $V_{CC} = 12V$ ,  $R_1 = 22K\Omega$ ,  $R_2 = 6.8K\Omega$ ,  $R_C = 1K\Omega$ ,  $R_E = 560\Omega$ .
16. The gain of an amplifier is 100. When negative feedback is applied, gain is reduced to 20 ? Find the fraction of output that is feedback to the input.
17. Determine the operating frequency and feedback fraction for Colpitt's oscillator. Given  $C_1 = 0.001\mu F$ ,  $C_2 = 0.01\mu F$ ,  $L = 10\mu H$ .
18. A certain differential amplifier has a differential voltage gain of 2000 and a common mode gain of 0.2. Determine CMRR and express it in dB.
19. Simplify the following Boolean expressions :  $Y = (\bar{A} + B)(A + B)$ .
20. Explain sum of product method with examples. (3×4=12)

## SECTION – D

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

21. Draw the circuit of a single stage CE amplifier. Explain the function of each components. Also show that o/p is  $180^\circ$  out of phase with the i/p.
22. Explain Barkhausen criterion. With the help of a diagram explain the working of a phase shift oscillator.
23. Explain the working of an op-amp integrator and differentiator.
24. Explain Karnaugh map. Explain pairs, quads and octets with examples. (5×2=10)





K17U 0383

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VI Semester B.Sc. Degree (CBCSS – Regular) Examination, May 2017  
(2014 Admn.)

CORE COURSE IN PHYSICS

(Elective – B)

6B15 PHY : Astronomy and Astrophysics

Max. Marks : 40

Time : 3 Hours

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

SECTION – A

Answer **all**-very short answer type-**each** question carries **1** mark :

1. Name a celestial co-ordinate in the horizontal system.
2. 1 parsec = \_\_\_\_\_
3. The color index of Sun is \_\_\_\_\_
4. Charge of cosmic rays are \_\_\_\_\_

(1×4=4)

SECTION – B

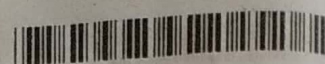
Answer **any seven**-short answer type-**each** question carries **2** marks :

5. Describe Zenith and Nadir.
6. Explain Zeeman effect.
7. What are Solar flares ?
8. Explain luminosity of star.
9. What is meant by singularity ?
10. Write the properties of cosmic rays.

P.T.O.

(2×7=14)

P.T.O.



11. How a black hole is formed ?
12. What are Meteorites ?
13. What is the relation between parsec and light year ?
14. Explain solar wind.

(2×7=14)

### SECTION – C

Answer **any four**-short essay/problem-**each** question carries **3** marks :

15. In the spectrum of distant galaxy, the lines observed are Doppler shifted by 20% towards the longer wavelength. Calculate its radial velocity.
16. Explain the three Kirchoff's laws of spectra.
17. Obtain the relation between absolute and apparent magnitude. The apparent magnitudes of Alpha centuari and Betelgeuse are  $-0.10$  and  $+0.80$  respectively. Compare the brightness of these stars.
18. What is Schwarzschild radius of a black hole ? Calculate the Schwarzschild radius of a star with 5 solar mass.
19. Find the expression for  $u(\lambda)d\lambda$  using Planck's law for  $u(\nu)d\nu$ .
20. Explain the concept of pulsars.

(3×4=12)

### SECTION – D

Answer **any two**-long essay type-**each** question carries **5** marks :

21. Explain the Harvard system of special classification and the HD catalogue.
22. What are the sources of the continuous radio emission that is measured in the galaxy ? Comment on the different components of this radiation.
23. Explain the 11 year solar cycle and sunspots.
24. Describe the horizontal, ecliptic and equatorial co-ordinate system for describing the position of a heavenly object.

(5×2=10)