K18U 0132

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – Reg./Suppl./Imp.) Examination, May 2018
(2014 Admn. Onwards)
CORE COURSE IN PHYSICS
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. Magnetic susceptibility is _____ for paramagnetic material.
2. Divergence of magnetic field is always _____
3. Ampere's circuital law is modified by _____
4. Cyclotron uses _____ to bend particle path into circle. **(1×4=4)**

SECTION – B

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

5. Show that divergence of bound current density is zero.
6. What is Ampere's circuital law inside a magnetized material ?
7. Obtain an expression for current density in terms of electric field.
8. Newton's 3rd law is not valid in electrodynamics. Why ?
9. What is magnetic charge ?
10. Show that polarization current density obeys equation of continuity.
11. Write down three dimensional wave equation.
12. What is monochromatic plane wave ?
13. How electrostatic generator works ?
14. What is the working principle of electrostatic voltmeter ? **(2×7=14)**

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SECTION – C

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

15. What is the torque experienced on a magnetic dipole in a magnetic field ?
16. A long copper rod of radius R carries a uniform free current I_f and bound current I_b. Find H inside the rod.
17. Derive Newmann's formula for mutual inductance. How can we say that mutual inductance is a geometrical quantity ?
18. The intensity of sunlight is 1300 W/m^3. Find the amplitude of electric field and magnetic field. For a perfect reflector what will be the radiation pressure exert by it ?
19. Derive the relation between refractive index and dielectric constant of a medium. Refractive index of water is 1.33. Find out dielectric constant of it.
20. Explain Hall effect. What is hall coefficient. **(3×4=12)**

SECTION – D

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

21. Explain the terms :
    1) Diamagnetism
    2) Magnetization
    3) Linear media
    4) Domain of Ferro magnetic material
    5) Hysteresis loop.
22. Explain Faradays law of electromagnetic induction. What was the importance of Faraday's law in electrodynamics ?
23. Explain energy, momentum, pointing vector, intensity and radiation pressure of electromagnetic waves.
24. Discuss working of :
    1) CRO
    2) Mass spectrometer. **(5×2=10)**

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Reg. No. : ..1711S.K.P.H.R.01..........

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VI Semester B.Sc. Degree (CBCSS-Reg./Supple./Imp.) Examination, May 2018
CORE COURSE IN PHYSICS
6B12 PHY : Photonics and Spectroscopy
(2014 Admn. Onwards)

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. In a Ruby laser, the active medium is
2. An optical fibre works on the principle of
3. The separation between any two adjacent rotational spectral lines is
4. Who discovered the principle of holography ?

(1×4=4)

SECTION – B

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

5. Explain how image is constructed from a hologram.
6. Define numerical aperture. Deduce an expression for it.
7. What are the advantages of a hologram over ordinary photograph ?
8. What is meant by population inversion in laser ?
9. What is meant by pumping ? Discuss the different types of pumping.
10. Discuss two applications of holography.
11. What are hot bands ? Why they called so ?
12. Spherical top molecules do not show rotational spectrum. Why ?
13. What is Born-Oppenheimer approximation ?
14. Explain the phenomenon of total internal reflection.

(2×7=14)

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SECTION – C

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

15. The J = 0 → 1 transition in HCl occurs at 20.68 cm^{-1} regarding the molecule to be a rigid rotator. Calculate the wavelength of the transition J = 14 → 15.

16. The mean intermolecular distance for HCl in the v = 0 and v = 1 level is 1.293 A°. Calculate the difference in cm^{-1} between the first P line and first R line in the rotation-vibration spectrum. Given that μ of HCl = 1.6275×10^{-27} kg.

17. In a ruby laser the ruby rod contain a total of 3×10^{19} chromium ions. If laser emits lights of 6943 A° wavelength, find the energy of one emitted photon and the total energy available per laser.

18. 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.

19. A step index fiber is made with core of refractive index 1.52, a diameter of 29 μm and a fractional difference index of 0.0007 it is operated at a wavelength of 1.3 μm. 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 $\lambda = 5000$ A°.

(3×4=12)

SECTION – D

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

21. Establish a relation between Einstein's coefficients.

22. Explain the vibrational spectrum of a diatomic molecule considering it as an anharmonic oscillator.

23. Obtain an expression for the rotational energy levels of a diatomic molecule taking it as a rigid rotator.

24. Briefly explain an optical fiber. Using ray theory discuss the mechanism of transmission of light within an optical fiber.

(5×2=10)

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Reg. No. : .....

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VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.) Examination, May 2018
Core Course in Physics
6B13 PHY : QUANTUM MECHANICS
(2014 Admn. Onwards)

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. The Wilson-Sommerfield quantization rule is _____
2. Write down the de Broglie relation.
3. The photoelectric effect establishes that light travels in the form of _____
4. Zeeman effect is the confirmation of _____ **(1×4=4)**

SECTION – B

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

5. List out the basic experimental results of the photoelectric phenomena.
6. Explain the assumptions of Planck with regard to cavity radiation.
7. Illustrate the uncertainty principle on the basis of single slit experiment.
8. What are stationary states ?
9. Outline the various admissibility conditions on the wavefunction of a system.
10. What is meant by expectation value of a dynamical variable ?
11. A particle confined in a box must have a certain minimum energy called zero point energy. Comment.

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12. Explain Zeeman effect.

13. Explain the magnetic quantum number of an atom.

14. What does tunnelling mean ? (2×7=14)

SECTION – C

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

15. From a sodium surface, light of wavelength 3125 Å and 3650 Å causes emission of electrons whose maximum kinetic energy is 2.128eV and 1.595 eV, respectively. Estimate Planck's constant and work function of sodium.

16. The average lifetime of an excited atomic state is 10^{-9}s. If the spectral line associated with the delay of this state is 6000 Å, estimate the width of the line.

17. Explain how barrier tunnelling accounts for α – decay by certain nuclei.

18. Electrons with energies of 1.0 eV and 2.0 eV are incident on a barrier 10.0 eV high and 0.50 nm wide.
    a) Find their respective transmission probabilities.
    b) How are these affected if the barrier is doubled in width ?

19. Verify that the average value of 1/r for a 1s electron in the hydrogen atom is $1/a_0$. Given $\psi = \frac{1}{\sqrt{\pi a_0^3}} e^{-r/a_0}$.

20. Discuss Stern-Gerlach experiment. (3×4=12)

SECTION – D

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

21. What is Compton effect ? How does Compton effect provide a conclusive evidence of the particle properties of radiation ?

22. State and explain the postulates of quantum mechanics.

23. A particle is trapped in a square well potential of finite depth. Show that the particles have a nonzero probability of being found outside the well even if its energy is less than the height of the barriers.

24. Obtain Schrödinger equation for the hydrogen atom in spherical polar coordinates. (5×2=10)

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VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.) Examination, May 2018
CORE COURSE IN PHYSICS
6B14 PHY : Electronics – II
(2014 Admn. Onwards)

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. RC coupling is used for _____ amplification.
2. An oscillator employs _____ feedback.
3. In a non-inverting amplifier, $R_i = 10K\Omega$ and $R_f = 100K\Omega$. The closed loop voltage gain is _____
4. The inputs to an XOR gate is 1, 0 and 1, the output will be _____ **(1×4=4)**

SECTION – B

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

5. What do you mean by operating point ?
6. What is meant by negative feedback ?
7. What is Barkhausen criterion ?
8. What do you understand by hybrid parameters ?
9. What do you mean by CMRR ?
10. What do you mean by (i) open-loop voltage gain (ii) closed-loop voltage gain of an op-amp ?
11. What is indicated by plus (+), dot(.) and bar (–) in a Boolean expression ?

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12. State De Morgan's theorems.
13. What is the Boolean equation for CARRY and for SUM in a half adder ?
14. What is a QUAD in a karnaugh map ? **(2×7=14)**

SECTION – C

Answer **any four**-short essay/problem. **Each** question carries **three** marks.

15. Calculate the emitter current in the voltage divider circuit. Also find the value of V_{CE} and collector potential V_C. Given $V_{CC} = 20V$, $R_1 = 20K\Omega$, $R_2 = 5K\Omega$, $R_C = 2K\Omega$, $R_E = 2K\Omega$.
16. Calculate the operating frequency and feedback fraction of a Hartley oscillator. Given $L_1 = 1mH$, $L_2 = 0.1$ mH, $C = 10$ pF. The mutual inductance between the coils, $M = 0.02$ mH.
17. In a negative feedback amplifier, the gain without feedback $A_V = 6400$, $Z_{in} = 1K\Omega$, $Z_{out} = 5K\Omega$, $R_1 = 10K\Omega$ and $R_2 = 70K\Omega$. Find (i) feedback fraction, (ii) gain with feedback, (iii) input impedance with feedback, (iv) output impedance with feedback.
18. In an op-amp, the resistance R_i to the inverting terminal is $2.2K\Omega$ and closed loop voltage gain is –100. Find the feedback resistance R_f.
19. Simplify the expression : $X = \overline{A}\overline{B}C + A\overline{B}C + AB\overline{C} + ABC$.
20. Explain product of sum 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° out of phase with the i/p.
22. Explain negative feedback. Derive an expression for gain in a negative voltage feedback amplifier. What are the advantages of negative feedback ?
23. Explain the working of inverting and non inverting amplifier and derive an expression for voltage gain for each case.
24. Explain Karnaugh map. Explain pairs, quads and octets with examples. **(5×2=10)**

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VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.) Examination, May 2018

CORE COURSE IN PHYSICS

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

(2014 Admn. Onwards)

Time : 3 Hours Max. Marks : 40

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

SECTION – A

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

1. Black body is one which _____ all the radiations.
2. Y-axis in HR diagram is _____
3. Dark central region in sunspot is called _____
4. Corona is the extensive halo seen around the Sun at the time of _____

(1×4=4)

SECTION – B

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

5. Define absolute magnitude.
6. Define parsec.
7. What is meant by color index of a star ?
8. Explain solar wind.
9. What is Schwarzschild radius of a black hole ?
10. Explain Doppler effect.

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11. Explain Limb darkening.
12. What are comets ?
13. What are cosmic rays ?
14. Explain pulsars. (2×7=14)

SECTION – C

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

15. The spectrum of star shows a Doppler shift of 10^{-2} Å of a line whose natural wavelength is 5000 Å. Calculate the velocity of the star along the line of sight.
16. Using Wien's displacement law, find the temperature of an object whose blackbody spectrum peaks at the wavelength of 1) 4000 Å & 2) 6563 Å.
17. Define the following :
    1) Visual Magnitude
    2) Photovisual Magnitude
    3) Photographic Magnitude.
18. What is HR diagram ? Draw it.
19. If the strength of the galactic magnetic field is 10^{-2} G, what would be the splitting of 21 cm line of neutral hydrogen ?
20. Distinguish between absolute and apparent magnitude. Also obtain the relation between them. (3×4=12)

SECTION – D

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

21. Give an account on the internal structure and atmosphere of Sun.
22. What are galaxies ? Explain the origin and evolution of galaxies. How are they classified ?
23. Discuss the Stellar positions and any two celestial co-ordinate system for describing the position of a heavenly object.
24. Explain the Harvard system of special classification and the HD catalogue. (5×2=10)

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