K20U 0138

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS-Reg./Supple./Improv.) Examination, April 2020
(2014 Admission 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. For diamagnetic materials magnetic susceptibility is
2. Write differential form of modified Ampere's circuital law.
3. Write an example for longitudinal wave.
4. Betatron are used to accelerate

SECTION – B

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

5. Draw hysteresis loop of Ferro magnetic materials.
6. Write boundary conditions in magneto statics.
7. Magnetic field is solenoidal. Why ?
8. What are gauge transformation ?
9. Prove that polarization current density obeys continuity equation.
10. A changing magnetic field induces electric field. Explain.
11. Show that mutual inductance is a purely geometrical quantity.
12. Derive three dimensional wave equation for E.
13. What is mass spectrometer ?
14. What is Hall effect ?

P.T.O.

SECTION – C

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

15. A long copper wire of radius 2 mm carries a uniformly distributed free current 2mA. Find magnitude and direction of H at a loop of radius 1 mm inside the wire.

16. Explain physical significance of bound currents in magnetic materials.

17. Derive Poynting theorem.

18. Find self inductance per unit length of a solenoid of radius R, carrying N number of turns per unit length.

19. Calculate amplitude of electric field E due to light, 2 m away from a 100 W lamp radiating equally in all direction.

20. Distinguish between cyclotron and betatron.

SECTION – D

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

21. Describe :
    1) Ferro magnetism, hysteresis loop
    2) Curie point
    3) Dia magnetism.

22. Derive boundary conditions in electrodynamics for linear media.

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

24. Explain :
    1) Electrostatic generator
    2) Hall effect
    3) Auto transformer.

———————

K20U 0139

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS-Reg./Supple./Improv.) Examination, April 2020
(2014 Admission Onwards)
Core Course in Physics
6B12 PHY : PHOTONICS AND SPECTROSCOPY

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. Give an example of asymmetric top molecule.
2. The wavelength of light in He-Ne laser is _____.
3. The inner part of optical fiber is called _____.
4. The selection rule for rotation level transition is _____.

SECTION – B

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

5. What is meant by numerical aperture of an optical fiber ?
6. What are the different types of energies possessed by a molecule ?
7. Briefly explain : Acceptance angle and critical angle.
8. Discuss two applications of holography.
9. Define cavity life time.
10. List any four applications of Laser.

P.T.O.

11. Define symmetric molecule. Give an example.

12. What is the change in the rotational constant B when hydrogen is replaced by deuterium in the hydrogen molecule ?

13. Mention the advantages of optical fiber sensor over conventional sensors.

14. What is meant by population inversion in laser ?

SECTION – C

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

15. The force constant of the bond in CO molecule is 187N/3 and its reduced mass is 1.14×10^{-26} kg. Compute the frequency of vibrations of the CO molecule and the spacing between its vibrational energy levels.

16. Calculate the numerical aperture and acceptance angle of an optical fiber with core n = 1.55 and cladding n = 1.5.

17. State and explain Morse function for molecules.

18. Discuss any one application of an optical fiber as a sensor.

19. The first line in the rotation spectrum of carbon monoxide has a frequency of 3.8424 cm^{-1}. Calculate the rotational constant and hence the C – O bond length of carbon monoxide.

20. A ruby laser beam with wavelength 690 nm is incident on an object. The power of the beam is 25 mW and diameter is 1.25 mm. Determine the intensity of the laser beam falling on the object.

SECTION – D

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

21. What are the properties of Laser ? Define Einstein co-efficients. Derive the relation between Einstein co-efficients.

22. Discuss how a diatomic molecule having a rotating vibrator could explain the features of near infra-red absorption spectra.

23. Briefly explain an optical fiber. Using ray theory discuss the mechanism of transmission of light with in an optical fiber.

24. Obtain an expression for the rotational energy levels of a diatomic molecule taking it as a rigid rotator. Discuss its spectrum and the relevant selection rule.

K20U 0140

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.) Examination, April 2020
(2014 Admission Onwards)
Core Course in Physics
6B13PHY : QUANTUM MECHANICS

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Expression for Compton wavelength is _____
2. Give the uncertainty relation for energy.
3. Expectation value of any observable is given by
4. The solution of Schrodinger equation of a free particle is _____

SECTION – B

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

5. What is quantum mechanical tunneling ?
6. Explain Davisson and Germer experiment with proper diagram.
7. What is correspondence principle ?
8. Define the terms work function and cut off wavelength.
9. List the sets of possible quantum numbers for a hydrogen atom with n = 3.
10. An Eigen function of the operator d^2/dx^2 is $\Psi = e^{2x}$. Find the corresponding Eigen value.
11. State and explain uncertainty principle.

P.T.O.

12. What is zero point energy of a harmonic oscillator ?
13. An electron and proton has same kinetic energy. Evaluate the ratio of de Broglie wavelength of electron to that of proton.
14. What is meant by Ultra Violet catastrophe ?

SECTION – C

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

15. The threshold wavelength of silver is 2762 angstrom. Calculate the maximum kinetic energy of the ejected electrons and maximum velocity of electron when silver is illuminated with UV light of 2000 angstrom.
16. Show that the maximum recoil energy of a free electron of rest mass m_0, when struck by a photon of frequency ν is given by $E_{max} = \dfrac{(h\vartheta)^2}{h\vartheta + \dfrac{1}{2} m_0 c^2}$.
17. The time independent wave function of a particle of mass m moving in a potential $V(x) = \alpha^2 x^2$ is $\psi(x) = \exp\left(-\sqrt{\dfrac{m\alpha}{2\hbar^2}} x^2\right)$, where α being a constant. Find the energy of the system.
18. Solve the Schrodinger equation for one dimensional square potential barrier.
19. Find the energy of particle in a box using quantization rule.
20. Write down the expression for the wavelengths emitted by a hydrogen atom. Also explain the various spectral series of hydrogen atom.

SECTION – D

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

21. A) Explain the concept of elliptic orbits of hydrogen atom using Sommerfeld quantization rule.
    B) Explain the assumptions of Planck with regard to cavity radiation.
22. Derive the time dependent Schrodinger equation for a free particle.
23. Obtain the wave equation for linear harmonic oscillator.
24. Explain the different postulates of quantum mechanics in detail.

K20U 0141

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.) Examination, April 2020
(2014 Admission Onwards)
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. The most commonly used transistor arrangement is _____ configuration.
2. Oscillator employes _____ feedback.
3. The gain of an ideal OP-AMP 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 Quality factor ?
7. Define β. Show that $\beta = \frac{\alpha}{1-\alpha}$.
8. What do you mean by CMRR ?
9. What are the three basic logic gates ?
10. Explain the function of class B power amplifiers.
11. What are encoders and decoders ?

P.T.O.

12. What is the purpose of a coupling capacitor in a transistor amplifier ?

13. Sketch the model of dc load line and show the Q point, saturation point and cut off point.

14. Draw a half adder circuit. What is the Boolean equation for CARRY and for SUM in a half adder ?

SECTION – C

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

15. For a single stage transistor amplifier the collector load $R_C = 2\ K\Omega$ and i/p resistance $R_i = 1\ K\Omega$. If the current gain is 50. Calculate the voltage gain of the amplifier.

16. Explain the working of an OP-AMP as an integrator.

17. Simplify the expression : $X = \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} + ABC$.

18. The gain of an amplifier is 100. When negative feedback is applied, gain is reduced to 40. Find the feedback fraction applied. If the gain falls to 60 when feedback is applied, what would have been the gain without feedback, keeping the same feedback fraction.

19. Determine the operating frequency and feedback fraction for Colpitt's oscillator. Given $C_1 = 0.001\ \mu F$, $C_2 = 0.01\ \mu F$, $L = 10\ \mu H$.

20. Explain sum of product method with examples.

SECTION – D

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

21. What is meant by transistor biasing ? Explain the biasing methods of base resistor and voltage divider bias used in transistors.

22. Explain Karnaugh map simplification with examples of pairs, quads and octects.

23. Explain the working of an op-amp in inverting and non-inverting configurations. Also derive an expression for closed loop voltage gain in each case.

24. With the help of a neat diagram explain the phase shift oscillator and mention the advantages and disadvantages.

———————

K20U 0143

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS-Reg./Supple./Improv.) Examination, April 2020
(2014 Admission Onwards)
CORE COURSE IN PHYSICS (Elective B)
6B15PHY : 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. The apparent luminosity of zero magnitude star is
2. The origin chosen for ecliptic system
3. The distance of sun from earth is 1.495×10^{11}m. In terms of parsec it is
4. The name of the group served as the primary standard for the measurement of the photovisual magnitude is

SECTION – B

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

5. What are solar flares ?
6. What is solar telescope ?
7. Give any four main parts of a telescope.
8. Define the term photo diffusion time.
9. Explain the visual method.
10. What is red shift ?
11. Distinguish between white dwarf and black hole.
12. What is Schwarzschild radius of a black hole ?
13. What is the relation between parsec and light year ?
14. Mention two applications of color index.

P.T.O.

SECTION – C

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

15. What are pulsars ? How can we detect them ?

16. With the neat Hertsprung-Russell diagram, explain the different parts of it.

17. Explain Chandrasekhar limit.

18. The parallax angle for Sirius isd 0.379 degree. Find the distance to Sirius in units of

    i) parsec ii) light year

    iii) AU iv) metre

19. Obtain the relation between absolute and apparent magnitude. The apparent magnitudes of Alpha centuari and Betelgese are – 0.10 and + 0.80 respectively. Compare the brightness of these stars.

20. Using Wien's displacement law, find the temperature of an object whose black body spectrum peaks at the wavelength of

    1) 4000Å and 2) 6563Å

SECTION – D

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

21. Explain the Harvard system of special classification and the HD catalogue.

22. Explain the following : Horizontal system, equatorial system and ecliptic system.

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

24. Explain the following : Plank's theory of Black body radiation, Doppler effect and Zeeman effect.