29/11/16 A

22531

V Semester B.Sc. Examination, November/December 2016
(Semester Scheme)
PHYSICS (Paper – V) (Course 501)
Gravitation, Space Physics and Electronics

Time : 3 Hours Max. Marks : 60

***Instructions**: Answer should be written completely in **English**.*

PART – A

Answer **any five** of the following questions. **Each** carries **six** marks. **(5×6=30)**

1. a) Write vector form of Newton's law of gravitation.

   b) Obtain an expression for gravitational potential and field intensity due to a uniform solid sphere at a point
      i) outside and
      ii) on the surface. **(1+5=6)**

2. a) Explain geostationary satellite.

   b) What are
      i) Sound waves
      ii) Gravity waves
      iii) Rossby waves
      iv) Kelvin waves. **(2+4=6)**

3. What is a tunnel diode ? Why it is called so ? Explain characteristics of a tunnel diode. **(1+1+4=6)**

4. What are 'h' parameters ? Derive an expression for the current gain and voltage gain of a transistor amplifier in CE mode in terms of 'h' parameters. **(2+4=6)**

5. a) Explain briefly how a CRO can be used to measure
      i) voltage
      ii) frequency.

   b) What are the merits of integrated circuits ? **(4+2=6)**

P.T.O.

6. What is an operational amplifier ? Explain the ideal characteristics of an op-amp. **(1+5=6)**

7. a) What is an oscillator ?
   b) Explain with a circuit diagram the working of Colpitt's oscillator. Write the expression for frequency of oscillation, feedback factor and gain. **(1+5=6)**

8. a) State De Morgan's theorems.
   b) Describe the function of full-adder with necessary circuit, Boolean equation and truth table. **(2+4=6)**

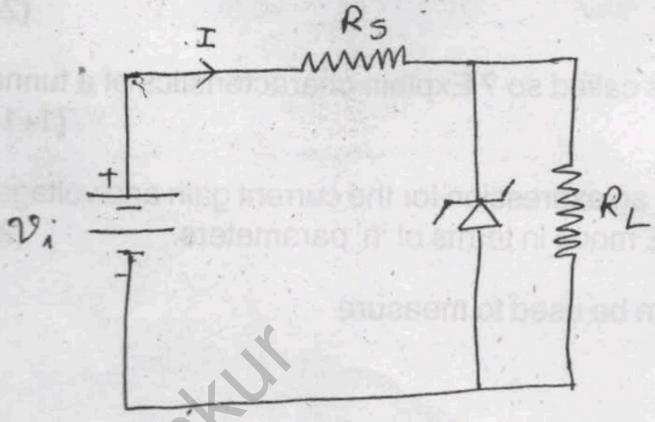
PART – B

Answer **any four** questions. **Each** carries **five** marks. **(4×5=20)**

9. The period of moon around the earth is 27.3 days and the radius of the orbit is 3.9×10^5 km. Find the mass of the earth, given $G = 6.67\times10^{-11}\ Nm^2\ kg^{-2}$.

10. What is the temperature change of a 10 kg parcel when heated at rate H = 100W for 10 minutes. Water vapour mixing ratio is $r = 0.01\ g_{vapour}/g_{air}$ and the air parcel is stationary. $C_p = 1013.11 J\ kg^{-1}k^{-1}$.

11. In the circuit given below $V_i = 18V$, $V_z = 10V$, $R_s = 270\Omega$ and $R_L = 1\ K\Omega$. Is the Zener diode operating in the break down region. If yes , what is the Zener current ?



12. The following readings are obtained experimentally from a JFET.

V_{GS}	OV	OV	– 0.2V
V_{DS}	7V	15V	15V
I_D	10 mA	10.25 mA	9.65 mA

Determine

i) a. c. drain resistance

ii) trans conductance and

iii) amplification factor.

13. In a Hartley oscillator $L_1 = 0.1$ mH, $L_2 = 10\ \mu$H, M = 20 μH. Find the value of the capacitor of oscillator circuit, to obtain a frequency of 4100 KHz.

14. a) Convert the following numbers to hexadecimal

i) $(64)_8$ ii) $(41)_8$ iii) $(11.44)_8$

b) Convert the following numbers to hexadecimal

i) $(52)_{10}$ ii) $(19.8125)_{10}$

PART – C

Answer **any five** of the following questions. **Each** carries **two** marks. **(5×2=10)**

15. a) Why is Newton's law of gravitation called a universal law ?

b) Under what circumstances would your weight be zero ?

c) Why does air that is rapidly compressed into a small volume get hot ?

d) What is the difference between persistence forecast and a trend forecast ?

e) What is the resistance of ideal diode when

i) forward biased and ii) revere biased

f) What is the basic condition for the proper functioning of a transistor as an amplifier ?

g) What is a byte ? What is a nibble ?

h) What is the condition for a NAND to have a high output ?

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Q.P. Code – 42532

Fifth Semester B.Sc. Degree Examination, October/November 2019

(CBCS Scheme)

Physics

Paper VI – ELEMENTS OF MODERN PHYSICS ASTROPHYSICS AND MATERIAL SCIENCE

Time : 3 Hours] *[Max. Marks : 90*

Instructions to Candidates : Answers should be written in English only.

PART – A

Answer any **FIVE** of the following questions. Each question carries 8 marks. **(5 × 8 = 40)**

1. Derive an expression for the frequency and wave number of an emitted spectral line in hydrogen like atom. **(8)**

2. What is photoelectric effect? Describe Einstein's photoelectric effect by using Planck's Quantum Theory. **(1+7)**

3. What is Comptom effect? Derive an expression for Compton shift. **(2 + 6)**

4. Derive an expression for core pressure of a star by using Linear Density model. **(8)**

5. (a) Define luminosity and brightness of a star. **(2+6)**

   (b) What is H-R diagram? How is it used to explain the characteristics of star?

6. Explain briefly the following :

   (a) Neutron stars

   (b) Super nova and

   (c) Black hole **(3 + 3 + 2)**

7. (a) Explain top down and bottom up synthesis of nano materials on example for each.

   (b) Explain the distinct properties of fullerene and carbon nanotubes. **(4 + 4)**

8. (a) Explain piezoelectric effect and mention its application.

   (b) Derive the Clausius Mossotti equation. **(4 + 4)**

PART – B

Answer any **SIX** questions from the following. Each question carries 5 marks : **(6 × 5 = 30)**

9. Calculate the radius frequency and energy of the electron in the nth orbit in hydrogen from the following data :

$e = 1.602 \times 10^{-19} c \quad m = 9.1 \times 10^{-31} kg \quad h = 6.625 \times 10^{-34} js \quad \epsilon_0 = 8.854 \times 10^{-12} f/m$ and $c = 3 \times 10^8 m/s$.

10. The photoelectric work function of a metal is 2.061 eV. Calculate the threshold wavelength and frequency for the metal

$h = 6.625 \times 10^{-34} js$

$c = 3 \times 10^8 m/s$

$1ev = 1.6 \times 10^{-19} j$.

11. The position and momentum of 1 Kev electron are simultaneously measured. If its position is located within $1A^0$, what is the percentage of uncertainty in its momentum.

$m = 9.1 \times 10^{-31} kg \quad h = 6.625 \times 10^{-34} js \quad e = 1.6 \times 10^{-19} C$.

12. Calculate the average temperature of the star of mars $2m_\odot$ and radius 2.5 $R_\odot$. Given average temperature of sun = 2.88×10^6 lc.

13. If the luminosity and surface temperature of star Sirius and 26.1 $L_\odot$ and 10.000 k respectively. Calculate its radius.

Given $\sigma = 5.67 \times 10^{-8} wm^{-2}k^{-4} \quad L_\odot = 3.9 \times 10^{26} W$.

14. Calculate the gravitational potential energy of the sun according to linear density model and hence calculate the lifetime of the sun according to gravitational binding energy consideration.

Given :

$G = 6.673 \times 10^{-11} Nm^2kg^{-2}$

$N_\odot = 2 \times 10^{30} kg$

$L_\odot = 4.52 \times 10^{26} w$

$R_\odot = 7 \times 10^8 m$.

15. The spectroscopic values of Rydberg's constant for the hydrogen and ionized helium are 109677.7 and 109722.4 respectively. Calculate the ratio of e/m for an electron assuming the specific charge of hydrogen ion as 96490 coulomb/gm.

16. The dielectric constant of the gas at NTP is 1.0000684. Calculate the electronic polarizability of He atom if the gas contains 2.7×10^{23} per cubic meter and hence calculate the radius of the He atom.

    Given $\epsilon_0 = 8.85\times10^{-12}$ F/m.

PART – C

Answer any **TEN** of the following questions. Each question carries 2 marks. **(10 × 2 = 20)**

17. (a) The concept of trajectory has no meaning in quantum mechanics. Explain.
    (b) Is Rydberg's constant a constant for all nuclei? Comment.
    (c) Does the De Broglie waves produce dispersion in vacuum? Explain.
    (d) How a white dwart start attain's stability? Explain.
    (e) Neutron star's are also called pulsar's why?
    (f) Is an atom smaller than a nanometer? How?
    (g) What is piezoelectric effect? Mention any two applications.
    (h) Why dielectric materials are used in capacitors?
    (i) How many hexagonal and pentagonal rings exist in C-60 fullerene?
    (j) The life cycle of a star is decided by its initial mall. Explain.
    (k) Does the color of a star depends on temperature? Explain.
    (l) What type of molecules give rise to the liquid crystal phase?

Fifth Semester B.Sc. Degree Examination, October/November 2019

(CBCS Scheme)

Physics

Paper V – DIGITAL ANALOG CIRCUITS AND SEMICONDUCTOR DEVICES

Time : 3 Hours] *[Max. Marks : 90*

Instructions to Candidates : Answers should be written in English only.

PART – A

Answer any FIVE of the following questions. Each question carries 8 marks. **(5 × 8 = 40)**

1. (a) Explain OR gate using diodes with truth table and logic circuit.
   (b) Give the truth table for NAND gate. **(6 + 2)**

2. (a) What are minterms and maxterms?
   (b) Explain half adder with truth table and logic circuit. **(2 + 6)**

3. (a) With a neat diagram. Explain the construction of CRO.
   (b) Explain how CRO is used to determine the frequency. **(6 + 2)**

4. (a) What are p-type and t-type semi conductors? Mention the majority charge carriers in p-type and n-type semiconductors.
   (b) Explain the barrier formation is pn junction diode. **(4 + 4)**

5. (a) What is bipolar junction transistor? Mention its types.
   (b) Explain the characteristics of a transistor in common-emitter mode. **(2 + 6)**

6. What is load line and operating point? Explain how DC load line is drawn. **(8)**

7. Explain the classification of embedded system
   (a) based on generation and
   (b) based on complexity and performance. **(8)**

8. With a neat block diagram, explain pin diagram of 8085 processors. **(8)**

PART – B

Answer any **SIX** questions from the following. Each question carries 5 marks :

(6 × 5 = 30)

9. Convert the following decimal numbers to their binary equivalents.

   (a) $25_{(10)}$

   (b) $37.625_{(10)}$

10. Simplify the following expression using Boolean algebra and draw logic diagram $A\left[\overline{ABC} + A\overline{B}C\right]$.

11. Using Karnaugh map simplify the following expression :

    $Y = \overline{A}\overline{B}C + \overline{A}BC + AC + \overline{A}B\overline{C}$

12. In a transistor base current I_B and collector current I_C are 80 μA and 1.85 mA respectively. Calculate α and β of a transistor. What will be the emitter current?

13. Find the operating point for a voltage divider bias circuit with npn transistor. Given $R_1 = 4\,\text{K}\Omega$, $R_2 = 1\,\text{K}\Omega$, $R_C = 470\Omega$, $R_E = 220\Omega$ and $V_{CC} = 15V$.

14. A transistor used in CE configuration has the following set of h-parameters.

    $h_{ie} = 1k\Omega$, $h_{fe} = 100$, $h_{re} = 5\times10^{-4}$ and $h_{oe} = 2\times10^{-5}$ If $R_S = 2k\Omega$ and $R_L = 5k\Omega$

    Calculate :

    (a) input impedance

    (b) output impedance

    (c) current gain

15. Write a program to add 49H and 56H stored in the memory locations 2501 H and 2502 H respectively.

16. Write a program to exchange the contents of memory locations 2000 H and 4000 H.

PART – C

Answer any **TEN** of the following questions. Each question caries 2 marks.

(10 × 2 = 20)

17. (a) Why is binary system preferred to decimal system in digital circuits?

(b) AND gate is equivalent to logical multiplication. Why?

(c) Write 2's complement of $1011_{(2)}$.

(d) Name logic gate whose output is HIGH when its inputs are different.

(e) What are Lisssajous figures?

(f) What is aquadog? Why is it used in a CRT?

(g) Is emitter heavily doped in a transistor? Justify.

(h) Why is CE mode preferred to CB mode in a transistor amplifier?

(i) Name any two applications of embedded system.

(j) What is working principle of LED?

(k) What are stack and sub routine?

(l) What are reactive and real time systems?

Q.P. Code – 22532

Fifth Semester B.Sc. Degree Examination, October/November 2019

(Non-CBCS – Semester Scheme – Repeaters)

Physics

Paper VI (503) – QUANTUM MECHANICS, ATOMIC PHYSICS AND MOLECULAR PHYSICS

Time : 3 Hours] *[Max. Marks : 60*

Instructions to Candidates : Answers should be written in English only.

PART – A

Answer any **FIVE** of the following. Each sub-question carries **6** marks : **(5 × 6 = 30)**

1. Explain clearly the following effects on the basis of quantum mechanics :
   (a) Atomic spectra
   (b) Black body radiation
   (c) Photoelectric effect **(2 + 2 + 2)**

2. With theory explain Bohr Quantum condition and De Broglie wavelength of a particle. **(6)**

3. (a) State Heisenberg's uncertainty principle.
   (b) Explain γ-ray microscope experiment to bring out the concept of uncertainty principle. **(1 + 5)**

4. (a) Write any two characteristics of a wave function.
   (b) Derive the Schrodinger time-dependent wave equation. **(2 + 4)**

5. Explain the variation of Rydberg's constant with the mass of a nucleus bringing in the concept of reduced mass. **(6)**

6. Give an account of various quantum numbers associated with vector atom model. **(6)**

7. What is Zeeman effect? Give the theory of Debye's Quantum theory of Normal Zeeman effect. **(1 + 5)**

8. Obtain an expression for the rotational energy levels of diatomic molecule and the frequency of the rotational spectra. **(6)**

PART – B

Answer any **FOUR** questions from the following. Each question carries **5** marks : **(4 × 5 = 20)**

[Data : h = 6.625×10^{-34}Js, $m_e = 9.1\times10^{-31}$kg, $e = 1.6\times10^{-19}$c, $\epsilon_0 = 8.854\times10^{-12}$Fm^{-1}, $m_H = 1.67\times10^{-27}$kg, $C = 3\times10^{8}$ms^{-1}, $1\,amu = 1.66\times10^{-27}$kg, $k = 1.38\times10^{-23}$JK^{-1}]

9. Calculate the de-Broglie wavelength of an α-particle accelerated through a potential difference of 4 KV.

10. Calculate the wavelength of thermal neutron at temperature 300 K.

11. Find the probability that a particle in a one dimensional box of length L can be found between 0.4 L to 0.6 L for the ground state.

12. Calculate the zero point energy and the spacing of the energy levels in one dimensional oscillator with an oscillator frequency of 1 KHz.

13. In the Stern-Gerlach experiment silver atoms traverse a distance of 0.1 m in a non-homogeneous magnetic field of field gradient 55 Tm^{-1}. The velocity of silver atoms is 450 ms^{-1}. Calculate the separation between the two traces on the photographic plate which is 0.5 m from the pole pieces. Mass of silver atom = 1.79×10^{-25} kg and Bhor magneton = 9.2×10^{-24} JT^{-1}.

14. With the exciting radiation of wavelength 435.8 nm, a Raman line at a wavelength of 462.4 nm was observed. Find the wavelength and frequency of the corresponding antistokes lines.

PART – C

Answer any **FIVE** questions from the following. Each question carries **2** marks : **(5 × 2 = 10)**

15. (a) An electron and proton have the same kinetic energy. Which one has greater momentum?

(b) Explain why electron cannot exist in the nucleus.

(c) Can one eigen value have many eigen functions?

(d) The zero point energy of a harmonic oscillator is not zero. Why?

(e) Which experimental evidence supports space quantization? Explain.

(f) What are the values of magnetic quantum number if the orbital quantum number is 3?

(g) Does all particles obey the Pauli's exclusion principle?

(h) Why does sky appears blue? Explain.

Q.P. Code – 22531

Fifth Semester B.Sc. Degree Examination,
October/November 2019

(Semester Scheme – Repeaters 2015 onwards)

Physics

Paper V (501) – GRAVITATION SPACE PHYSICS AND ELECTRONICS

Time : 3 Hours] *[Max. Marks : 60*

Instructions to Candidates : Answers should be written in English only.

PART – A

Answer any **FIVE** of the following questions. Each question carries **6** marks : **(5 × 6 = 30)**

1. Obtain an expression for gravitational potential and field due to a uniform solid sphere at a point inside the sphere. **(6)**

2. With the help of a neat diagram, explain the vertical structure of the atmosphere. **(6)**

3. (a) What is zener diode? Explain V.I. characteristics of a zener diode.

   (b) Distinguish between ordinary diode and zener diode. **(4 + 2)**

4. (a) Define :
   (i) Drain resistance
   (ii) Transconductance
   (iii) Amplification factor of JFET.

   (b) Write any three difference between JFET and BJT. **(3 + 3)**

5. (a) Distinguish between thin film and thick film components.

   (b) Write the merits of IC's over discrete circuits. **(2 + 4)**

6. Explain the op-amp as non-inverting amplifier and derive the expression for its voltage gain. **(6)**

7. (a) What is an oscillator?

   (b) Explain with a neat diagram the working of Colpitt's oscillator. Write the expression for frequency of oscillation, feedback factor and gain. **(1 + 5)**

8. What is logic gate? Explain AND, OR and NOT gate with symbol and their Truth table. **(6)**

PART – B

Answer any **FOUR** questions. Each question carries **5** marks : **(4 × 5 = 20)**

9. A body weighs 0.9 kg.wt on the surface of the earth. How much will it weigh on the surface of mars whose mass in one-ninth and radius one-half that of earth?

10. A satellite is moving round the earth at a distance of 896 km from it. Calculate its orbital velocity and period of revolution, taking the earth's radius to be 6400 km and g = 9.8 ms^{-2}.

11. In a CE amplifier, the h parameters of the transistor used are $h_{ie} = 3\,k\Omega$, $h_{fe} = 50$, $h_{re} = 7.5 \times 10^{-4}$ and $h_{0e} = 2 \times 10^{-5} s$. Calculate the values of input and output impedences, if $R_L = 1k\Omega$ and $R_S = 1.5k\Omega$.

12. The base current in a transistor is equal to 0.01 mA and emitter current is 1 mA, calculate the value of α and β.

13. (a) Convert $(10111011)_2$ and $(110.01)_2$ into decimal.

    (b) Convert $(25)_{10}$ and $(0.862)_{10}$ to binary.

14. Using Boolean algebra simplify the given expression $X = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}B\overline{C} + \overline{A}BC$. Realise the simplified expression using logic gates.

PART – C

Answer any **FIVE** of the following questions. Each question carries **2** marks : **(5 × 2 = 10)**

15. (a) Write any two applications of remote sensing.

    (b) Differentiate weather from climate.

    (c) Can a pendulum vibrate in an artificial satellite? Explain.

    (d) Why air rapidly compressed into a small volume get hot?

    (e) What is aquadag? Why is it used in a CRT?

    (f) What are passive components? Give example.

    (g) Write any two advantages of Wein-Bridge oscillator.

    (h) How many bits are there in a nibble and a byte?

22531

V Semester B.Sc. Examination, Nov./Dec. 2013
(Semester Scheme)
PHYSICS
Paper – V(501) : Gravitation, Space Physics, Atmospheric Physics and Electronics

Time : 3 Hours Max. Marks : 60

Instruction : *Answers should be written completely in* ***English only.***

PART – A

Answer **any five** of the following questions. **Each** question carries **six** marks. **(5×6=30)**

1. Obtain an expression for gravitational potential and field intensity due to a solid sphere at a point outside it and at a point on its surface. **6**

2. a) What is orbital velocity of a satellite ?
   b) Derive an expression for orbital velocity and period of revolution of artificial satellite around the earth. **(1+5)**

3. a) What is 'Parcel of air' ?
   b) Explain hydrostatic balance and static stability of the atmosphere. **(1+5)**

4. a) Describe the working of N-channel JFET.
   b) Define parameters of the JFET. **(3+3)**

5. a) Distinguish between thin film and thick film components.
   b) What are the merits of integrated circuits over discrete circuits ? **(4+2)**

6. With neat circuit diagram, describe the working of op-amp as an inverting amplifier. Derive an expression for its voltage gain. **6**

7. a) State Barkhausen criterion for sustained oscillations.
   b) With a circuit diagram, describe the working of a Wien-Bridge oscillator. **(2+4)**

8. a) What is a logic gate ? Why NOR gate is called universal gate ?
   b) Explain full adder with a logic circuit and truth table. **(2+4)**

P.T.O.

PART – B

Answer **any four** of the following questions. **Each** question carries **five** marks. **(4×5=20)**

9. Two bodies of masses 25 kg and 50 kg are separated by a distance 1m. Find the force between them. What will the force be, if distance between the bodies is doubled ? Given $G = 6.673\times10^{-11}\ Nm^2Kg^{-2}$. **5**

10. The escape velocity on the earth is 11.2 Kms^{-1}. Find the escape velocity on a planet whose mass is twice that of the earth and whose radius is thrice that of the earth. **5**

11. A stabilized voltage of 12 V across a load whose current varies from 5 mA to 35 mA with an unregulated d.c. supply of 18V is to be obtained with a Zener voltage of 12 V and maximum Zener current of 20 mA. Calculate the value of the current limiting resistance and power dissipated in it. **5**

12. A transistor used in CE configuration has the following set of hybrid parameters.

    $h_{ie} = 1.5\ K\Omega$, $h_{re} = 3\times10^{-4}$

    $h_{fe} = 80$, $h_{oe} = 2\times10^{-5}S$

    If the load resistance in the collector circuit is 5 $K\Omega$, find voltage gain and current gain. **5**

13. An amplifier with negative feedback has a voltage gain of 100. It is found that without feedback, an input signal of 50 mV is required to produce a given output whereas with feedback the input signal is 0.6 V for the same output. Calculate the open loop gain and feedback factor. **5**

14. a) Convert the decimal number 57.183 into its binary equivalent.

    b) Simplify $ABC + \bar{A}C + BC$ and draw the logic diagram. **(2+3)**

PART – C

Answer **any five** of the following questions. **Each** question carries **two** marks. **(5×2=10)**

15. a) Will the gravitational force between two bodies change if the medium between them is changed ? Explain. **2**

b) What is the difference between persistence forecast and trend forecast ? **2**

c) Why the negative resistance region of the characteristics of a tunnel diode is used for high frequency oscillations ? **2**

d) Why transistor is known as bipolar device ? **2**

e) Can we interchange emitter and collector in a transistor for its proper operation ? Explain. **2**

f) What controls intensity and sharpness of a spot in a CRO ? **2**

g) What are the values of input and output impedances of an ideal op-amp ? **2**

h) How many NAND gates are required to make (i) AND gate (ii) OR gate ? **2**

22532

V Semester III Year B.Sc. EXAMINATION,
NOVEMBER/DECEMBER 2013.

(Semester Scheme)

PHYSICS

Paper VI 503 — Quantum Mechanics Atomic Physics and Molecular Physics

Time : 3 Hours Max. Marks : 60

Instructions : Answer should be written completely in English.

PART A

Answer **any five** of the following questions. Each questions carries 6 marks.
(5 × 6 = 30)

1. Explain clearly the failure of classical theory in the explanation of
   (a) Compton effect
   (b) Specific heat of solids (3+3)
2. With relevant theory explain G.P. Thomson's experiment on electron diffraction. (6)
3. (a) State and explain the uncertainty principle
   (b) Write the other forms of the uncertainty principle
   (c) Why electrons cannot be present inside the nucleus? (2+2+2)
4. Derive the expressions for the Eigen values and Eigen functions of a linear harmonic oscillator. (6)
5. Describe Frank-Hertz experiment to determine the excitation and ionisation potentials. (6)
6. Give the theory of Debye's quantum theory of normal Zeeman effect. What is Paschen-back effect? (5+1)
7. What is space quantization? Explain Stern-Gerlack experiment to establish this. (1+5)
8. What is meant by 'Scattering of light'? Describe experimental arrangement of Raman effect. (1+5)

PART B

Answer **any four** of the following questions Each questions carries 5 marks.
(4 × 5 = 20)

9. Estimate the limit of resolution of an electron microscope uses 50 Kev electrons and the radius of the aperture subtends an angle of 30° at the particle. (5)

P.T.O.

10. Find the phase and group velocity of an electron whose de. Broglie wave length is 1.5 A° (neglect relativistic effect) (5)

11. Find the momentum and energy value for an electron in a box of length 1A° for n=1 and n=2. (5)

12. Calculate the zero point energy and the spacing of the energy levels in one dimensional oscillator with an oscillator frequency of 1 KHz. (5)

13. Calculate the Zeeman shift observed in the normal Zeeman effect when a spectral line of wave length 600 nm is subjected to a magenetic field of 0.6 T given $e/m = 1.76 \times 10^{11} cKg^{-1}$. (5)

14. With an exciting radiation of wave length 602.24 nm a substance showed a Raman line at a wavelength of 620.2 nm find the wavelength and frequency of the corresponding antistokes line. (5)

PART C

(5 × 2 = 10)

Answer **any five** of the following questions. Each question carries 2 marks.

15. (a) The concept of trajectory has no meaning in quantum mechanics explain.

(b) Explain why electron cannot exist in the nucleus.

(c) The physical variables used to describe a confined electron is also discrete why?.

(d) The zero point energy of a harmonic oscillator is not zero why?

(e) Why anamalous zeeman effect is observed in atoms with odd number of electrons in the outermost orbit explain.

(f) Why do all molecules not show rotational spectra?

(g) What experimental evidence supports space quantization? Explain.

(h) How does Raman spectra differ from ordinary rotational spectra with respect to its selection rule?

22531

V Semester B.Sc. Examination, Nov./Dec. 2015
(Semester Scheme)
PHYSICS (Paper – V) (501)
Gravitation, Space Physics, Atmospheric Physics and Electronics

Time : 3 Hours Max. Marks : 60

Instruction : ***Answer*** *should be written* ***completely*** *in* ***English*** *only.*

PART – A

Answer **any five** of the following questions. **Each** question carries **six** marks. **(5×6=30)**

1. a) Distinguish between inertial and gravitational mass.
   b) Show the equivalence of inertial and gravitational mass. **(3+3)**

2. a) What is orbital velocity ?
   b) Derive an expression for orbital velocity and period of revolution of artificial satellite around the earth. **(1+5)**

3. a) What is Zener diode ? Explain V-I characteristics of a Zener diode.
   b) Distinguish between ordinary diode and Zener diode. **(4+2)**

4. With neat diagram explain different parts of cathode ray tube and explain any two applications. **6**

5. a) Distinguish between thin film and thick film components.
   b) What are the merits of integrated circuit over discrete circuits ? **(2+4)**

6. Explain the application of an op-amp as non-inverting amplifier and derive expression for its voltage gain. **6**

7. a) State Bark Hausen criterion for sustained oscillations.
   b) With neat diagram and formula, explain working of Colpitt's oscillator. **(2+4)**

8. a) What is an AND gate ? Why NAND gate is called universal gates ?
   b) Explain full adder with logic circuit. **(2+4)**

P.T.O.

PART – B

Answer **any four** of the following questions. **Each** question carries **five** marks. **(4×5=20)**

9. A sphere of 40 kg is attracted by another sphere of mass 80 kg. When their centres are 0.3 m apart with a force equal to the weight of 0.25 mg. Calculate the Gravitational constant, Assume $g = 9.8\ ms^{-2}$, what will be the force in Newton, if the distance between the sphere is doubled ?

10. A satellite is moving round the earth at a distance 600 km from it. Calculate its orbital velocity and period of revolution ($G = 6.67 \times 10^{-11}$ SI Unit).

11. An ac supply of 230 V is applied to a half wave rectifier circuit through a transformer of turn ratio 10 :1 find

    i) out put dc voltage and

    ii) the peak inverse voltage

    Assume the diode to be ideal.

12. The height of the display of a signal is 6 cm and its width 7.6 cm. Given that the deflection factor of the vertical amplifier is 10 V/cm and the time base control is 5 milli second. Determine

    a) Peak to peak voltage

    b) The period of signal

    c) The frequency.

13. Convert the following :

    a) Convert the following decimal number 37 in to its binary equivalent

    b) Convert (356) hexa to its decimal equivalent.

14. Simplify and draw the logic diagram for $AB + ABC + AB\overline{C} + \overline{A}BC$.

PART – C

15. Answer **any five** questions. **Each** question carries **two** marks. **(5×2=10)**

a) Why is Newton's law of gravitation is called a Universal Law ?

b) Why does atmospheric pressure decreases with attitude ?

c) Can a pendulum vibrate in a artificial satellite. Explain.

d) Why are silicon devices more preferred than germanium devices ?

e) Why does a JFET have low noise level ?

f) Why are most transistor n-p-n type and not p-n-p type ?

g) Can you see the various components in an IC ? Explain.

h) Can we call an oscillator as an amplifier ? Explain.

Q.P. Code – 22531

Fifth Semester B.Sc. Degree Examination, November 2017

(Semester Scheme)

Physics

Paper V (501) – GRAVITATION, SPACE PHYSICS AND ELECTRONICS

Time : 3 Hours] *[Max. Marks : 60*

Instructions to Candidates : Answers should be written completely in English.

PART – A

Answer any **FIVE** of the following questions. Each question carries **6** marks. **(5 × 6 = 30)**

1. Derive Kepler's second law of planetary motion from Newton's laws using Vector method. **(6)**

2. With the help of a neat diagram, explain the vertical structure of the atmosphere. **(6)**

3. (a) What is a Tunnel diode?

   (b) Describe V-I characteristics of a Tunnel diode. **(1 + 5)**

4. (a) Describe the working of N-channel JFET.

   (b) Write any two differences between FET and BJT. **(4 + 2)**

5. (a) Distinguish between thin film and thick film components.

   (b) Write the merits of IC's over discrete circuits. **(2 + 4)**

6. What is an operational amplifier? Explain the op-amp as an adder or summer and derive an expression for its output voltage. **(1 + 5)**

7. (a) With neat circuit diagram, explain the working of Wein-bridge oscillator.

   (b) Write the advantages of Wein-bridge oscillator. **(4 + 2)**

8. What is a logic gate? Explain AND, OR and NOT gate with symbol and their truth table. **(6)**

PART – B

Answer any **FOUR** questions. Each question carries **5** marks : **(4 × 5 = 20)**

9. The period of moon around the earth is 27.3 days and the radius of the orbit is 3.9×10^5 km. Find the mass of the earth, given $G = 6.67 \times 10^{-11}\ \text{Nm}^2\ \text{kg}^{-2}$.

10. Calculate the escape velocity of a body from earth from the following data :

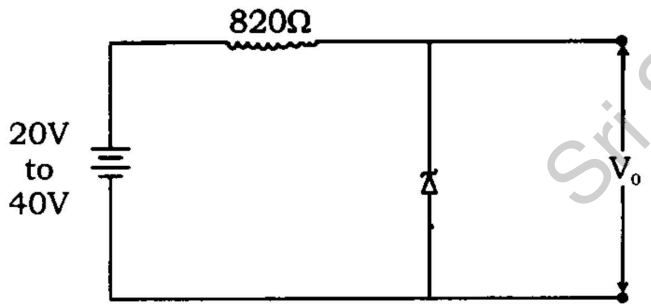
    Mass of the earth = 6×10^{24} kg

    Radius of earth = 6.4×10^6 m

    Gravitational constant = $6.67 \times 10^{-11}\ \text{Nm}^2\ \text{kg}^{-2}$

    Using the value of escape velocity calculated above, find the escape velocity of a body on the surface of Mars. Mars has a mass $\frac{1}{9}$ and radius $\frac{1}{2}$ that of the earth.

11. The zener diode shown below has a breakdown voltage of 10 V. What is the minimum and maximum value of zener current?



12. The current gain of transistor in common emitter (CE) circuit is 49. Calculate common base (CB) current gain. Find the base current when the emitter current is 3 mA.

13. (a) Convert $(456)_{10}$ and $(0.8125)_{10}$ into binary.

    (b) Convert $(11001100)_2$ and $(101.10)_2$ into decimal.

14. Using Boolean algebra

    (a) Prove that $(A + \overline{A}B) = (A + B)$

    (b) Show that $ABC + A\overline{B}C + AB\overline{C} = A(B + C)$.

PART – C

Answer any **FIVE** of the following questions. Each question carries **2** marks : **(5 × 2 = 10)**

15. (a) Write the applications of remote sensing.

(b) What causes the greenhouse effect?

(c) What is the difference between persistence forecast and a trend forecast?

(d) Why does air that is rapidly compressed into a small volume get hot?

(e) What is the importance of Lissajous figures?

(f) What are passive components? Give example.

(g) Phase shift oscillators are not suitable for variable frequency. Explain.

(h) What is Bit? What is Byte?

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V Semester B.Sc. Examination, November/December 2014
(Semester Scheme)
PHYSICS (Paper – V)
Gravitation, Space Physics, Atmospheric Physics and Electronics

Time : 3 Hours Max. Marks : 60

Instruction : *Answer should be written* ***completely*** *in* ***English*** *only.*

PART – A

Answer **any five** of the following questions. **Each** question carries **six** marks. **(5×6=30)**

1. Obtain an expressions for the gravitational potential and field due to the solid sphere at any point inside the sphere. **6**

2. a) What is a satellite ?

   b) Define escape velocity. Derive an expression for escape velocity of an object on the earth. **(1+5)**

3. a) Explain Green house effect.

   b) Describe briefly how green house effect is enhanced. Also mention any one adverse effect of green house effect on the nature. **(3+3)**

4. a) What is a Zener diode ? Explain V – I characteristics of a Zener diode.

   b) Distinguish between Ordinary diode and Zener diode. **(4+2)**

5. a) Define the parameters of JFET and mention the relation between them.

   b) Compare a JFET and BJT. **(4+2)**

6. a) What is an operational amplifier ?

   b) Explain with circuit how an op-amp function as an inverting amplifier. Derive an expression for its gain. **(1+5)**

P.T.O.

7. a) State the Barkhausen criteria for sustained oscillations.
   b) With a neat circuit diagram, describe the working of a Wein bridge oscillator. **(2+4)**

8. a) What is a NAND gate ? Why it is called universal gate ?
   b) Explain a half -adder with truth table and a logic circuit. **(2+4)**

PART – B

Answer **any four** questions. **Each** question carries **five** marks. **(4×5=20)**

9. The force of attraction between two spheres of mass 40 kg and 80 kg is equal to the weight of a body of mass 8.7×10^{-8} kg and distance between the centres of the sphere is 0.5 m. Calculate the value of G. If the distance made double, what would be the new force ? Given $g = 9.8\ ms^{-2}$.

10. What is the potential energy of 3 kg of mass
    a) At the surface of the earth's and
    b) At a distance 2.5×10^5 km from the centre of the earth.
    Mass of the earth = 5.98×10^{24} kg
    Radius of the earth = 6400 km
    Gravitational constant = $6.67 \times 10^{-11}\ Nm^2\ kg^{-2}$.

11. In a transistor, the base current and collector current are 80 μ A and 1.85 mA respectively. Calculate α and β of the transistor. Also find the value of emitter currents.

12. In a CE amplifier, the h-parameters of the transistor used are hie = 3kΩ, hfe = 50, hre = 7.5×10^{-4} and hoe = 2×10^{-5} S. Calculate the values of input impedance, voltage and current gains if R_L = 1 kΩ and R_s = 1.5 k Ω.

13. a) Simplify $ABC + \overline{A}\ C + BC$ and draw the logic diagram.
    b) Draw the logic diagram for $\overline{A}\ \overline{C} + B$.

14. Convert the following :
    a) Decimal numbers is 158.72 into its binary equivalent.
    b) Hexadecimal number CA. AA into its octal equivalent and then to decimal.

PART – C

Answer **any five** questions. **Each** question carries **two** marks. **(5×2=10)**

15. a) Is angular momentum of a planet around the sun is a variable ? Explain.
    b) Mention the difference between weather and climate.
    c) Why saw-tooth voltage is used in CRO ? Explain.
    d) Which part of the characteristics of a tunnel diode is used for high frequency oscillations ?
    e) Can you see the various components in an IC ?
    f) What are active elements ?
    g) Why are three RC - sections used in a phase – shift oscillator ?
    h) A NOT-gate is known as an inverter. Why ?

Q.P. Code – 22532

Fifth Semester B.Sc. Degree Examination, November 2017

(Semester Scheme)

Physics

Paper VI (503) – QUANTUM MECHANICS, ATOMIC PHYSICS AND MOLECULAR SPECTRA

Time : 3 Hours] *[Max. Marks : 60*

Instructions to Candidates : Answers should be written completely in English.

PART – A

Answer any **FIVE** of the following questions. Each question carries **6** marks. **(5 × 6 = 30)**

1. Explain clearly the following effects on the basis of Quantum mechanics :
   (a) Compton effect.
   (b) Specific heat of solids. **(3 + 3)**

2. With theory explain Bohr quantum condition and deBroglie wavelength of a particle. **(2 + 4)**

3. (a) What are the characteristics of a wave function?
   (b) Derive the Schrodinger time independent wave equation. **(2 + 4)**

4. Derive the Eigen values and Eigen functions of a particle in one dimensional box. **(6)**

5. With neat diagram explain Frank-Hertz experiment to measure the Excitation potentials. **(6)**

6. Write a note on Seven quantum numbers. **(6)**

7. With neat diagram explain Stern-Gerlach experiment and give its theory. **(6)**

8. With neat diagram explain the experimental method of Raman effect, and give its quantum mechanical treatment. **(6)**

PART – B

Answer any **FOUR** of the following questions. Each question carries **5** marks. **(4 × 5 = 20)**

[Data : $h = 6.625 \times 10^{-34}$ Js, $m_e = 9.1 \times 10^{-31}$ kg, $e = 1.6 \times 10^{-19}$ C, $\epsilon_0 = 8.854 \times 10^{-12}$ Fm^{-1}, $M_H = 1.67 \times 10^{-27}$ kg, $C = 3 \times 10^8$ ms^{-1}, 1 amu $= 1.66 \times 10^{-27}$ kg]

9. An electron microscope uses 60 KeV electrons. If the aperture subtends an angle of 30° at the particle. Estimate the limit of resolution.

10. The position and momentum of 2 KeV electron were simultaneously determined. The position was located within 0.4 nm. What is the percentage of uncertainty in the momentum?

11. Calculate the Rydberg constant for singly ionized Helium (He^+) atom. $M_H = 1.67 \times 10^{-27}$ kg.

12. Find the momentum and energy of an electron confined to a box of 1 Å, for the ground state and first excited state.

13. What is the magnetic flux density B is required to observe the normal Zeeman effect? If a spectrometer can resolve spectral line separated by 0.05 nm at 500 nm.

14. The $J = 0$ to $J + 1$ absorption line in CO occurs at a frequency 1.153×10^{11} Hz. Calculate the moment of inertia and bond length. Given 1 amu $= 1.66 \times 10^{-27}$ kg.

PART – C

Answer any **FIVE** of the following questions. Each question carries **2** marks. **(5 × 2 = 10)**

15. (a) A charged electron moves in a circular orbit; yet the atom is stable. Explain.

(b) Electromagnetic radiation a wave or a particle. Explain.

(c) An electron and a neutron have the same de-Broglie wavelength. Which one will move faster?

(d) Explain why electron cannot exist in the nucleus.

(e) Distinguish between a free particle and a particle in a box.

(f) Can the position of the particle be precisely defined in quantum theory?

(g) Why are doublets are observed in alkali spectra?

(h) Write the electronic configuration for oxygen.

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V Semester B.Sc. Examination, November/December 2015
(Semester Scheme)
(503) : PHYSICS – VI
Quantum Mechanics, Atomic Physics and Molecular Physics

Time : 3 Hours Max. Marks : 60

***Instruction** : Answer should be written **completely** in **English**.*

PART – A

Answer **any five** of the following questions. **Each** question carries **six** marks : **(5×6=30)**

1. Explain clearly the failure of classical theory in the explanation of :
   a) Black body spectrum and
   b) Atomic spectra. **(3+3)**

2. Describe G. P. Thomson's experiment to establish the existence of matter waves. **6**

3. a) Explain probability density.
   b) Set up Schrodinger time independent equation for a free particle. **(1+5)**

4. a) State Heisenberg's uncertainty principle.
   b) Explain γ-ray microscope experiment to bring out the concept of uncertainty principle. **(1+5)**

5. Explain the variation of Rydberg's constant with the mass of the nucleus bringing in the concept of Reduced mass. **6**

6. a) Write the important features of Vector atom model.
   b) Give an account of various quantum numbers associated with vector atom model. **(2+4)**

7. What is Zeeman effect ? Give the quantum theory of normal Zeeman effect. **(1+5)**

8. a) Write any two significant differences between Rayleigh Scattering and Raman Scattering.
   b) Explain Quantum theory of Raman effect. **(2+4)**

P.T.O.

PART – B

Answer **any four** of the following questions. **Each** question carries **five** marks : **(4×5=20)**

9. Calculate the De-Broglie wavelength of :
   a) A 10 gm bullet travelling at 500ms^{-1} and
   b) An electron with kinetic energy 2×10^{-19} J.

10. In Davission-Germer experiment electrons accelerated through a potential difference of 54 volt showed a maximum reflection at 50.8° (first order). Find the wavelength associated with these electrons. Calculate the voltage that should be applied to accelerate electrons if the second order max is to appear at 50.8° (second order) (d = 2.15Å).

11. Calculate the percentage of uncertainty in momentum if the position and momentum of 1 KeV electron are simultaneously determined. Assume the Position is located with in 4Å.

12. An electron is constrained in one dimensional box of side 10Å. Calculate first three Eigen values in e.v.

13. In Stem-Gerlach experiment Silver atom travels a distance of 0.1 m in a non-homogeneous magnetic field of field gradient 55 Tm^{-1}. The velocity of silver atom is 450 ms^{-1}. Calculate the separation between the two traces on the photographic plate which is 0.5 m from the pole pieces. Mass of the silver atom = 1.79×10^{-25} kg and $\mu = 9.2 \times 10^{-24}$ JT^{-1}.

14. With exiting radiation of wavelength 602.24 nm a substance showed a Raman line at a wavelength of 620.2 nm. Find the wavelength and frequency of the corresponding antistokes line.

PART – C

Answer **any five** of the following questions. **Each** question carries **two** marks : **(5×2=10)**

15. a) In what way quantum mechanics is different from classical mechanics.
    b) Give any two characteristics of wave function (ψ).
    c) Can matter waves travel faster than light ? Explain.
    d) The zero point energy of a harmonic oscillator is not zero. Why ?
    e) Which experimental evidence supports space quantisation ? Explain.
    f) The colour of the setting and rising sun is red. Explain.
    g) The homonuclear molecule donot show pure vibrational transition. Why ?
    h) Do all particles obey the Pauli's exclusion principle ? Comment.

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V Semester B.Sc. Degree Examination, November/December 2014
(Semester Scheme)
PHYSICS
Paper – VI (503) : Quantum Mechanics, Atomic Physics, Molecular Physics

Time : 3 Hours Max. Marks : 60

Instruction : *Answer should be written* ***completely*** *in* ***English.***

PART – A

Answer **any five** of the following questions. **Each** question carries **six** marks. **(5×6=30)**

1. Explain clearly the failure of classical theory in the explanation of
   a) Specific heat of solids
   b) Photo electric effect **6**

2. With relevant theory explain Davisson-Germer experiment to substantiate matter waves. **6**

3. a) State and explain the Heisenberg's uncertainty principle.
   b) Explain γ-ray microscope to bring out the concept of uncertainty principle. **(2+4)**

4. a) What are the characteristics of a wave function ?
   b) Set up Schrodinger's time dependent wave equation for a free particle. **(2+4)**

5. Explain the variation of Rydberg's constant with the mass of a nucleus bringing in the concept of reduced mass. **6**

6. a) State and explain Pauli's exclusion principle.
   b) Show that the maximum number of electrons in a shell of quantum number 'n' is "$2n^2$". **(2+4)**

P.T.O.

7. a) What is space quantization ?

   b) Explain with a necessary theory, Stern-Gerlach experiment to establish the concept of space quantization. **(1+5)**

8. Obtain an expression for the rotational energy levels of a diatomic molecule and the frequency of the rotational spectra. **6**

PART – B

Answer **any four** of the following questions. **Each** question carries **five** marks. **(4×5=20)**

(Data : $h = 6.625 \times 10^{-34}$ J-s, $m_e = 9.1 \times 10^{-31}$ Kg, $e = 1.6 \times 10^{-19}$ C, $\epsilon_0 = 8.85 \times 10^{-12}$ Fm^{-1}, $C = 3 \times 10^8$ ms^{-1})

9. Calculate the deBroglie wavelength of a) a ball of mass 1 Kg moving with a speed of 100 ms^{-1} and b) an electron travelling with a speed of 10^5 ms^{-1}.

10. An electron has a speed of 800 ms^{-1} with an accuracy of 0.004%. Calculate certainty with which we can locate the position of the electron.

11. Calculate the zero-point energy and the spacing between the successive energy levels in a one dimensional oscillator with a frequency 2 KHz.

12. Calculate the a) ionization potential and b) first exitation potential of hydrogen atom.

13. Calculate the Zeeman shift Produced between the component lines when a spectral line of wavelength 595 nm is subjected to a magnetic field of 0.45T.

14. In an experiment with Raman scattering the exciting radiation of wavelength 435.8 nm is used. If the wavelength of one of the scattered light is 462.4 nm, find the wavelength of the other line.

PART – C

Answer **any five** of the following questions. **Each** question carries **2** marks. **(5×2=10)**

15. a) An electron and proton have the same kinetic energy. Which one has greater momentum ?

    b) What is ultraviolet-catastrophe ? Explain.

    c) Explain why electrons cannot be present inside the nucleus.

    d) What are eigen values and eigen functions.

    e) What are the values of magnetic quantum numbers if the orbital quantum number l = 3 ?

    f) Why anamolous Zeeman effect is observed in atoms with odd number of electrons in the outer most orbit ? Explain.

    g) Why does sky appears blue ? Explain.

    h) Distinguish between free particle and a bound particle.

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V Semester B.Sc. Degree Examination, November/December 2016
(Semester Scheme)
PHYSICS
Paper – VI (503) : QUANTUM MECHANICS, ATOMIC PHYSICS AND MOLECULAR PHYSICS

Time : 3 Hours Max. Marks : 60

***Instruction** : Answer should be written **completely** in **English**.*

PART – A

Answer **any five** of the following questions. **Each** question carries **six** marks. **(5×6=30)**

1. Explain clearly the failures of classical theory in the explanation of :
   a) Black body radiation spectrum
   b) Compton effect. **(3+3)**
2. Describe G.P. Thomson's experiment to establish the existence of matter waves. **6**
3. a) State and explain Heisenberg's uncertainty principle.
   b) Write the different forms of the uncertainty principle.
   c) Why electrons can not be present inside the nucleus ? Explain. **(2+2+2)**
4. a) Write the Physical Significances of wave function.
   b) Derive the Schrondinger's time independent wave equation. **(2+4)**
5. Explain the variation of Rydberg's constant with the mass of a nucleus bringing in the concept of reduced mass. **6**
6. Briefly explain various quantum numbers associated with the vector atom model. **6**
7. a) What is Paschen-Back effect ?
   b) Give the quantum theory of normal Zeeman effect. **(1+5)**
8. Obtain an expression for the rotational energy levels of a diatomic molecule and frequency of the rotational spectra. **6**

P.T.O.

PART – B

Answer **any four** of the following questions. **Each** question carries **five** marks. **(4×5=20)**

(Data : $h = 6.625 \times 10^{-34}$ J – s,

$m_e = 9.1 \times 10^{-31}$ Kg, $e = 1.6 \times 10^{-19}$ C,

$\varepsilon_0 = 8.85 \times 10^{-12}$ Fm^{-1}, $C = 3 \times 10^8$ ms^{-1}).

9. Calculate the deBroglie wavelength of

   a) A ball of mass 10 gm bullet travelling at 500 ms^{-1} and

   b) An electron with kinetic energy of 150 ev.

10. Find the phase and group velocity of a non relativistic electron whose deBroglie wavelength is 1.5 Å.

11. Find the probability that a particle in a one dimensional box of length L can be found between 0.4 L to 0.6 L for the ground state.

12. How much energy is required to raise the hydrogen atom from the ground state to the excited state n = 4 ? What is the wavelength of the emitted spectral line when the atom returns to the ground state ?

13. In the Stern-Gerlach experiment silver atoms traverses a distance of 0.1m in a nonhomogeneous magnetic field of field gradient 55 Tm^{-1}. If the velocity of the silver atoms is 450 ms^{-1}, calculate the separation between the two trace on the collector plate 0.5 m from the pole pieces.
    Mass of silver atom = 1.79×10^{-25} kg and $\mu = 9.2 \times 10^{-24}$ JT^{-1}.

14. With the exciting radiation of wavelength 435.8 nm, a Raman line at a wavelength of 462.4 nm was observed. Find the wavelength and frequency of the corresponding antistokes line.

PART – C

Answer **any five** of the following questions. **Each** question carries **2** marks. **(5×2=10)**

15. a) An electron and proton have the same Kinetic energy. Which one has greater momentum ?

    b) The concept of trajectory has no meaning in quantum mechanics. Explain.

    c) Distinguish between a free particle and particle in a box.

    d) Is zero point energy of a harmonic oscillator is zero ? Explain.

    e) What is the significance of the negative sign in the energy expression of electron orbit ? Explain.

    f) For n = 3, how many elliptical and circular paths are possible ? Show diagrammatically.

    g) Does all particles obey the Pauli's exclusion principle ? Explain.

    h) Why does sky appears blue ? Explain.
