2016

(6th Semester)

PHYSICS

NINTH PAPER

(Method of Mathematical Physics—II)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Using the definition of -function, show that

$$(m, n) \quad \frac{(m \quad 1)!(n \quad 1)!}{(m \quad n \quad 1)!} \qquad 4$$

(b) Evaluate :

$$\int_0^1 \frac{x^2\,dx}{\sqrt{(1 \quad x^4)}} \quad \int_0^1 \frac{dx}{\sqrt{(1 \quad x^4)}} \qquad 6$$

Or

(a) Using the definition of error function, show that

$$erf_c(x) \quad erf_c(\quad x) \quad 2 \qquad 4$$

(b) Show that

$$\int_0 \frac{y^{m \quad 1}}{(1 \quad y)^{m \quad n}}\,dy \quad \int_0^1 \frac{y^{m \quad 1} \quad y^{n \quad 1}}{(1 \quad y)^{m \quad n}}\,dy \qquad (m, n) \qquad 6$$

2. *(a)* Find the Fourier integral of the function $e^{\quad kx}$, where $x \quad 0$ and $f(\quad x) \quad f(x)$, $k \quad 0$.

Hence show that $\int_0 \frac{\cos ux}{u^2 \quad 1}\,du \quad \frac{}{2} e^{\quad x}$ and also show that $\int_0 \frac{1}{u^2 \quad 1}\,du \quad \frac{}{2}$ for $x \quad 0$. 4+1+1

(b) Find the Fourier sine transform of $\frac{e^{\quad ax}}{x}$. 4

Or

(a) Find the Fourier transform of $e^{\quad \frac{r^2}{a^2}}$, where a is a constant and $r \quad \sqrt{x^2 \quad y^2 \quad z^2}$. 5

(b) Find the Fourier integral of the function

$$f(x) \quad \begin{cases} 0 & ; \quad x \quad 0 \\ \frac{1}{2} & ; \quad x \quad 0 \\ e^{\quad x} & ; \quad x \quad 0 \end{cases}$$

Hence verify the representation directly at the point $x \quad 0$. 4+1

3. *(a)* Find the Laplace transforms of the functions *(i)* $e^{at}\cos t$ and *(ii)* $e^{at}\sin t$. 2+2

(b) Find the inverse Laplace transforms of

$$f(s) \quad \frac{1}{s(s \quad 2)^3} \qquad 6$$

Or

(a) Using Laplace transform, solve the differential equation

$$t\frac{d^2x}{dt^2} \quad \frac{dx}{dt} \quad 4tx \quad 0$$

when $x(0) \quad 3$ and $x_1(0) \quad (x)_{t \quad 0} \quad 0$. 6

(b) If $\mathscr{L}[F(t)] \quad f(s)$, then show that

$$\mathscr{L} \quad \int_0^t F(t)\,dt \quad \frac{f(s)}{s}$$

Hence show that

$$\mathscr{L}[t^n F(t)] \quad (\quad 1)^n \frac{d^n}{ds^n} f(s); \quad n \quad 1, 2, 3, \ldots \qquad 2+2$$

4. *(a)* Prove that the reciprocal of a product of two or more elements of a group is equal to the product of the reciprocals in reverse order. 2

(b) Define inversion centre and explain it in the case of N_2O_2. 1+3

(c) Show that the four matrices

$$E \quad \begin{matrix} 1 & 0 \\ 0 & 1 \end{matrix}, \quad A \quad \begin{matrix} 0 & 1 \\ 1 & 0 \end{matrix}, \quad B \quad \begin{matrix} 1 & 0 \\ 0 & 1 \end{matrix}$$

$$\text{and} \quad C \quad \begin{matrix} 0 & 1 \\ 1 & 0 \end{matrix}$$

form a group under matrix multiplication. 4

Or

(a) Derive the matrix representation for geometric transformations. 6

(b) Show that the set of matrices

$$A \quad \begin{matrix} \cos & \sin \\ \sin & \cos \end{matrix}$$

where is the real form of a group under multiplication. 4

5. *(a)* What are the values of I calculated in each one of the following? 1+1

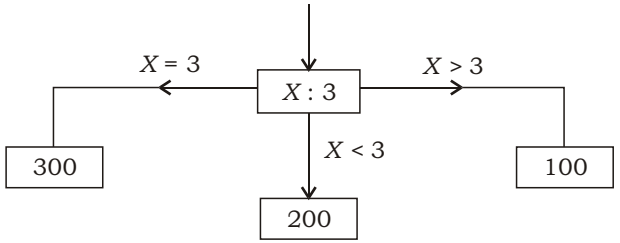
(i) $I \quad J \quad 2/3 \quad K/4 \quad 6 \quad J \quad 3/8$
(where $J \quad 2$ and $K \quad 5$)

(ii) $I \quad J/2 \quad 4 \quad 3/8 \quad J \quad 3$
(where $J \quad 3$)

(b) Write a FORTRAN program to find the slope and midpoint of a line. 4

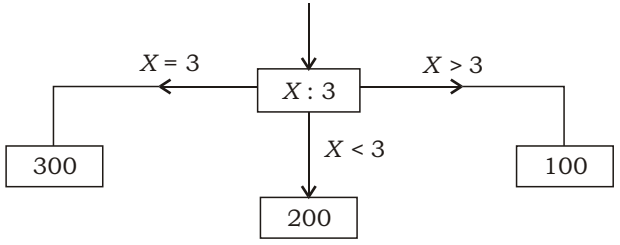
(c) Write a DO loop to read 100 numbers and print all numbers less than 30. 2

(d) Write the FORTRAN program segment using logical IF for the following flow chart : 2



Or

(a) Write the FORTRAN program segment using IF-THEN-ELSE for the following flow chart : 3



(b) Given the van der Waals' constants a and b for a gas, write a FORTRAN program to evaluate the critical temperature, pressure and volume using the formula :

$$T_c \quad \frac{8a}{27Rb}, P_c \quad \frac{a}{27Rb}, V_c \quad 3b$$

where R 0·0821. 3

(c) Write a FORTRAN DO loop to read the negative numbers between 1 and 100 and print their cubes. 2

(d) What do you mean by FORMAT specification and explain *E* format. 2

★★★

Subject Code : PHY/VI/09

Booklet No. A

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DEGREE 6th Semester
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Subject .....

Paper .....

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Regn. No. .....

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2 0 1 6

(6th Semester)

PHYSICS

NINTH PAPER

(Method of Mathematical Physics—II)

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—I

(*Marks* : 10)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. The value of $\Gamma(m)\,\Gamma(1-m)$ is

(a) $\dfrac{m\pi}{\sin m\pi}$ ( )

(b) $\dfrac{m}{\sin m\pi}$ ( )

(c) $\dfrac{\pi}{\sin m\pi}$ ( )

(d) $\dfrac{\pi}{m \sin m\pi}$ ( )

2. The value of $(1)_n$ is

(a) n ( )

(b) $-n$ ( )

(c) $n!$ ( )

(d) $\frac{1}{n!}$ ( )

3. The Fourier transform of $\delta(t)$ is

(a) 1 ( )

(b) 0 ( )

(c) $\sqrt{2\pi}$ ( )

(d) $\frac{1}{\sqrt{2\pi}}$ ( )

4. The function $f(x) = x^3 \sin x$ in the range $-\pi < x < \pi$

(a) is an even function ( )

(b) is an odd funtion ( )

(c) may be even or odd function ( )

(d) is a numeric function ( )

5. If $f(s)$ is the Laplace transform of $F(t)$, then $\mathscr{L}^{-1}[f(as)]$ is

(a) $\frac{1}{a}F\left(\frac{t}{a}\right)$ ( )

(b) $\frac{1}{a}F\left(\frac{a}{t}\right)$ ( )

(c) $aF\left(\frac{t}{a}\right)$ ( )

(d) $aF\left(\frac{a}{t}\right)$ ( )

6. The Laplace transform of $\delta(t)$ is

(a) 1 ( )

(b) 0 ( )

(c) $\sqrt{2\pi}$ ( )

(d) $\frac{1}{\sqrt{2\pi}}$ ( )

7. Each irreducible representation of an Abelian group is

(a) one dimensional ( )

(b) two dimensional ( )

(c) three dimensional ( )

(d) n dimensional $(n > 3)$ ( )

8. In the group $G = \{E, A, A^2\}$, the element conjugate to A^2 is

(a) E ( )

(b) A ( )

(c) A^2 ( )

(d) A^{-2} ( )

9. The final value of I in the DO statement, DO $10\, I = 1, 10, 2$ is

(a) 1 ( )

(b) 10 ( )

(c) 2 ( )

(d) 9 ( )

10. If $I = 3$, $J = 8$ and $K = 4$, then the value of A in the following statement

$$A = 3 * J / I * K - 4 / J$$

is

(a) $\frac{1}{2}$ ( )

(b) $\frac{3}{2}$ ( )

(c) 1 ( )

(d) 0 ( )

SECTION—II

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Prove that the factorial function $(\alpha)_n = \frac{\Gamma(\alpha + n)}{\Gamma(\alpha)}$.

2. Prove that $\delta(-x) = \delta(x)$.

3. Find Laplace transform of t^n, $n > -1$. What will be the Laplace transform of $\sqrt{t}$?

4. Show that the order of any element of a group is always equal to the order of its inverse.

5. Write a small program segment to read 100 numbers and if it is positive, print the square root of it.

★★★

2016

(6th Semester)

PHYSICS

TENTH PAPER

(Nuclear Physics—II)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The figures in the margin indicate full marks for the questions

1. What is quadrupole moment? Derive an expression for the electric quadrupole moment of a nucleus. Show that the smallest value of angular momentum (I), for which the quadrupole moment (Q) does not vanish, is one. 1+8+1=10

Or

(a) Explain the terms packing fraction and mass defect. What is their difference? 3

(b) What do you mean by semi-empirical mass formula? Explain its applications for determination of nuclear stability against -decay. 2+3=5

(c) Write a short note on volume energy of nucleus. 2

2. Explain in detail radioactive equilibrium. Obtain the conditions for transient equilibrium and secular equilibrium. 4+3+3=10

Or

(a) Define *(i)* mean life, *(ii)* half-life, *(iii)* natural radioactivity and *(iv)* radio-isotopes. 4

(b) What are different types of radioactive decay? Explain each type in brief. 6

3. *(a)* Explain nuclear fusion as the source of stellar energy. 4

(b) Explain nuclear fission and nuclear fusion. Explain how the energy is released in these reactions. 6

Or

(a) What do you mean by artificial transmutation? 1

(b) What are the properties of neutron? Discuss the determination of mass of neutron according to Chadwick. 4+5=9

4. Explain the principle, construction and working of betatron. What is the advantage of betatron? 8+2=10

Or

(a) Explain how photomultiplier tube is utilized in a scintillation counter. 4

(b) Describe the construction and working of linear accelerator. 6

5. *(a)* Discuss extensive air shower of cosmic rays. Explain the mechanism of air shower production. 3+3=6

(b) Write the origin of cosmic rays. What do you mean by soft component and hard component of cosmic rays? 2+2=4

Or

(a) Write down the six universal conservation laws of elementary particles. 3

(b) What do you mean by strangeness of elementary particles? Write the relation of baryon number (*B*), hypercharge (*Y*) and strangeness (*S*) of elementary particles. 2+1=3

(c) What is quark? Discuss different quarks and their properties. 4

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Subject Code : PHY/VI/10

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2 0 1 6

(6th Semester)

PHYSICS

TENTH PAPER

(Nuclear Physics—II)

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 10)

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×10=10

1. Binding energy increases linearly with the

(a) mass number ( )

(b) atomic number ( )

(c) magnetic moment ( )

(d) charge ( )

2. Odd nuclei are generally

(a) lighter ( )

(b) heavier ( )

(c) less stable ( )

(d) more stable ( )

3. The most penetrating ray is

(a) alpha ray ( )

(b) beta ray ( )

(c) gamma ray ( )

(d) cathode ray ( )

4. The SI unit of radioactivity is

(a) becquerel ( )

(b) curie ( )

(c) roentgen ( )

(d) roentgen/second ( )

5. The size of the uranium in a nuclear reactor is called critical size when the multiplication factor

(a) k 0 ( )

(b) k 1 ( )

(c) k 1 ( )

(d) k 1 ( )

6. Neutrons having energies between 10 MeV–50 MeV are called

(a) very fast neutrons ( )

(b) fast neutrons ( )

(c) slow neutrons ( )

(d) ultrahigh-energy neutrons ( )

7. The type of ionization chamber which measures voltage pulses due to the entry of individual ionizing particles is

(a) integrating type ( )

(b) pulse type ( )

(c) spark chamber ( )

(d) cloud chamber ( )

8. A device in which the frequency of the oscillator is matched with the revolution frequency of the electron is called

(a) cyclotron ( )

(b) electron synchrotron ( )

(c) linear accelerator ( )

(d) proton synchrotron ( )

9. The zenith angle distribution of cosmic rays in the East-West plane to magnetic equator is

(a) symmetrical ( )

(b) linear ( )

(c) non-linear ( )

(d) asymmetrical ( )

10. Which of the following particles is a meson?

(a) Proton ( )

(b) Neutron ( )

(c) Electron ( )

(d) Pion ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Write a short note on nuclear stability with reference to neutron-proton ratio.

2. Half-life of radon is 3·8 days. After how many days will 1/10 of a radon sample remain behind?

3. Give the main assumptions of liquid-drop model of the nucleus.

4. Describe briefly about the need for particle accelerator. Where do we have accelerators in India?

5. What are hyperons? Write the strangeness of different types of hyperons.

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2016

(6th Semester)

PHYSICS

ELEVENTH PAPER

(Electromagnetic Theory)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. *(a)* Write down the statement of boundary condition for e.m. wave in two different media. 2

(b) Deduce an expression for the energy stored in an inductor carrying a current. Hence find an expression for the energy density in a magnetic field. 2+3=5

Or

Derive Maxwell's first electromagnetic equation. What will be its form for free space and a dielectric medium? 5+1+1=7

2. Use Maxwell's electromagnetic equations to derive the wave equations satisfied by the electric field vector $\vec{E}$ and the magnetic field vector $\vec{B}$ in free space. Obtain their plane wave solutions. Establish the transverse nature of electromagnetic waves. 3+2+2=7

Or

Define Poynting vector. State and prove Poynting theorem. 2+1+4=7

3. Discuss reflection and refraction of electromagnetic wave for oblique incidence at the boundary between two linear dielectric media. 7

Or

(a) Starting from Maxwell's electromagnetic equations, show that an electromagnetic wave is damped inside a conducting medium. 4

(b) State and explain Brewster's law in electromagnetic waves. 1+2=3

4. Explain electromagnetic scalar and vector potentials. Discuss their non-uniqueness. What do you understand by gauge transformation? 3+3+1=7

Or

Explain Coulomb gauge and Lorentz gauge conditions. Use Lorentz gauge to deduce the Poisson's equations satisfied by the electromagnetic potentials in non-static conditions. Comment on these equations for static conditions. 3+3+1=7

5. Show that the total power radiated from an oscillating electric dipole in free space is

$$\langle P \rangle \quad \frac{p_0^2 \quad ^4}{12 \quad _0 c^3}$$

where p_0 is the amplitude of the oscillating dipole moment, is its angular frequency, $_0$ is the permittivity of free space and c is the speed of light in free space. 7

Or

Give Lorentz theory of dispersion of electromagnetic waves. Discuss normal and anomalous dispersions. 5+2=7

★★★

Subject Code : PHY/VI/11

Booklet No. A

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2016

(6th Semester)

PHYSICS

ELEVENTH PAPER

(Electromagnetic Theory)

(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—I

(*Marks* : 5)

Put a Tick ☑ mark against the correct answer in the box provided : 1×5=5

1. The differential form of Ampere's law in magnetostatics is

(a) $\vec{\nabla} \times \vec{B} = \mu_0 \vec{j}$ ☐

(b) $\vec{\nabla} \times \vec{B} = \mu_0 \vec{j}$ ☐

(c) $\vec{\nabla} \times \vec{E} = \frac{\vec{B}}{t}$ ☐

(d) $\vec{\nabla} \times \vec{E} = -\frac{\vec{B}}{t}$ ☐

where notations stand for their usual meanings.

2. The speed of light in free space is

(a) $\frac{1}{\sqrt{0\ 0}}$ ☐

(b) $\sqrt{0\ 0}$ ☐

(c) $\sqrt{\frac{0}{0}}$ ☐

(d) $\sqrt{\frac{0}{0}}$ ☐

3. An unpolarized electromagnetic wave travelling in air is incident on the surface of a transparent dielectric medium. If the angle of incidence is equal to the Brewster's angle of the wave for the medium, then the angle between the reflected and refracted parts of the wave is

(a) 60° ☐

(b) 30° ☐

(c) 90° ☐

(d) 45° ☐

4. If the vector and scalar potentials in a region of space are respectively $\vec{A}$ and V, then the magnetic field there exists is

(a) $\vec{A}$ ☐

(b) V ☐

(c) $\vec{A}$ V ☐

(d) $\vec{A}$ V ☐

5. For a TE wave inside a waveguide, the magnetic field vector $\vec{B}$ can be represented as

(a) $\vec{B}$ $\hat{i}B_x$ $\hat{j}B_y$ $\hat{k}B_z$ ☐

(b) $\vec{B}$ $\hat{i}B_x$ $\hat{j}B_y$ ☐

(c) $\vec{B}$ $\hat{i}B_x$ $\hat{k}B_z$ ☐

(d) $\vec{B}$ $\hat{j}B_y$ $\hat{k}B_z$ ☐

where notations stand for their usual meanings.

SECTION—II

(*Marks* : 15)

Give very short answers to the following questions : 3×5=15

1. Explain what you mean by displacement current.

2. Define radiation pressure and write down its expression for a perfect absorber and a perfect reflector of electromagnetic radiation in terms of its intensity.

3. Calculate the skin depth for an electromagnetic wave of wavelength 3 m (in free space) in a conducting medium of conductivity $6\ 10^{7}\ ^{1}\text{m}^{1}$ and permeability $4\ 10^{7}$ H/m.

4. Express the Lorentz force equation in terms of the scalar and vector potentials of electromagnetic field.

5. What is Rayleigh scattering?

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2016

(6th Semester)

PHYSICS

TWELFTH (A) PAPER

(Solid-State Physics—II)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. Derive dispersion relation for a one-dimentional diatomic lattice and differentiate between optical and acoustical branches. Why are these branches named so? 4+2+1=7

Or

Obtain dispersion relation for the lattice waves in a monoatomic linear lattice and hence discuss the dispersion behaviour at low frequency and high frequency respectively. 4+3=7

2. What are paramagnetic materials? Describe Langevin's theory of paramagnetism and obtain an expression for paramagnetic susceptibility. 1+6=7

Or

Describe the Weiss molecular field theory of ferromagnetism and derive Curie-Weiss law. 4½+2½=7

3. What is meant by polarization in dielectrics? Obtain an expression for the Lorentz field in a dielectric material and hence derive the Clausius-Mosotti equation. 1+3+3=7

Or

Obtain an expression for dielectric loss when a dielectric is subjected to an alternating field. Also obtain real and imaginary parts of the dielectric constant in terms of the frequency ω and the relaxation time τ. 4+3=7

4. Discuss the Kronig-Penny model for the motion of an electron in a periodic potential. 7

Or

What is meant by the effective mass of an electron? What is its significance? Show that the effective mass of an electron in a crystal is inversely proportional to the second derivative of the E-k curve. 1+2+4=7

5. Derive London's equation. Also describe how Cooper pair are formed. 4½+2½=7

Or

Describe the Meissner effect. Explain the difference between type I and type II superconductors using the Meissner effect. 3+4=7

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Subject Code : PHY/VI/12 (a)

Booklet No. A

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2 0 1 6

(6th Semester)

PHYSICS

TWELFTH (A) PAPER

(Solid-State Physics—II)

(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 5)

Put a Tick (✓) mark against the correct answer in the brackets provided : 1×5=5

1. Diamagnetic materials possess

(a) permanent magnetic dipoles ( )

(b) no permanent magnetic dipoles ( )

(c) induced dipole moment ( )

(d) magnetic domains ( )

2. Dispersion relation relates

(a) frequency and wavelength ( )

(b) wavelength and velocity ( )

(c) frequency and velocity ( )

(d) frequency and amplitude ( )

3. Relative permittivity of a dielectric is related to the electric susceptibility as

(a) $_e$ $_r$ 1 ( )

(b) $_e$ 1 $_r$ ( )

(c) $_r$ 1 $_e$ ( )

(d) $_e$ $_r$ 1 ( )

4. Forbidden energy gap of Ge is

(a) 1·08 eV ( )

(b) 1·43 eV ( )

(c) 0·7 eV ( )

(d) 0·45 eV ( )

5. The temperature at which a conductor becomes a superconductor is called

(a) superconducting temperature ( )

(b) Curie temperature ( )

(c) Onnes temperature ( )

(d) transition temperature ( )

SECTION—B

(*Marks* : 15)

Answer the following questions briefly : 3×5=15

1. Explain the cause of hysteresis phenomenon in ferromagnetic materials. What does the area of the loop signify?

2. What are phonons? Express the law of conservation of energy and momentum in the case of inelastic scattering of photon by phonons.

3. Explain different polarization mechanisms in dielectrics.

4. Distinguish among a metal, a semiconductor and an insulator on the basis of their energy band structure.

5. Describe the isotope effect in superconductors.

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2016

(6th Semester)

PHYSICS

TWELFTH (B) PAPER

(Electronics—II)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The figures in the margin indicate full marks for the questions

1. With the help of a neat circuit diagram, explain the working of Anderson's AC bridge. Obtain the two balance conditions and also discuss how they can be used to measure inductance. 3+3+1=7

Or

(a) What are *p*-type and *n*-type semi-conductors? Give a brief explanation of the energy barrier formation in *p-n* junction diode. 1+3=4

(b) Using appropriate diagram, give a brief discussion of load line analysis of diode. 3

2. Explain the working of half-wave rectifier using appropriate circuit diagram. Also obtain ripple factor and rectification efficiency of the circuit. 3+2+2=7

Or

How is Zener diode different from normal diode? Draw a circuit diagram showing the use of Zener diode as a voltage regulator. Explain how the circuit performs load regulation and line regulation. 1+2+2+2=7

3. Explain the working of RC-coupled amplifier with the help of a neat circuit diagram. Also draw the frequency-response curve of the amplifier and discuss the low frequency, mid frequency and high frequency region. 2+1+4=7

Or

Describe the voltage divider bias method. Explain how stabilization of operating point is achieved by this method. 4+3=7

4. Discuss the circuit operation of Hartley and Colpitt's oscillators. 3½+3½=7

Or

What is multivibrator? With a neat sketch, explain the working of astable multivibrator. 1+6=7

5. What is the difference between a JFET and a bipolar transistor? Explain the characteristics of JFET with its structural diagram. 2+5=7

Or

Explain amplitude modulation. Derive the voltage equation of an AM wave and also give a brief discussion of the sideband frequencies. 2½+2½+2=7

★★★

Subject Code : PHY/VI/12 (b)

Booklet No. A

Date Stamp .....

.....

To be filled in by the Candidate

DEGREE 6th Semester
(Arts / Science / Commerce / .....) Exam., **2016**

Subject .....

Paper .....

INSTRUCTIONS TO CANDIDATES

1. **The Booklet No. of this script should be quoted in the answer script meant for descriptive type questions and vice versa.**
2. **This paper should be ANSWERED FIRST and submitted within** *45 minutes* **of the commencement of the Examination.**
3. **While answering the questions of this booklet, any cutting, erasing, over-writing or furnishing more than one answer is prohibited. Any rough work, if required, should be done only on the main Answer Book. Instructions given in each question should be followed for answering that question only.**

To be filled in by the Candidate

DEGREE 6th Semester
(Arts / Science / Commerce / .....) Exam., **2016**

Roll No. .....

Regn. No. .....

Subject .....

Paper .....

Descriptive Type

Booklet No. B .....

Signature of Scrutiniser(s)

Signature of Examiner(s)

Signature of Invigilator(s)

2016

(6th Semester)

PHYSICS

TWELFTH (B) PAPER

(Electronics—II)

(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—I

(*Marks* : 5)

Choose the correct answer by putting a Tick (✓) mark in the brackets provided for it : 1×5=5

1. In intrinsic semiconductors

(a) no density of free electrons is greater than holes ( )

(b) no density of holes is greater than free electrons ( )

(c) there is equal amount of free electrons and holes ( )

(d) no density of free electrons is infinity ( )

2. In the output characteristic of a transistor in CE configuration, the active region is the region where

(a) collector junction is reverse biased and emitter-base junction is forward biased ( )

(b) collector junction as well as emitter-based junction is forward biased ( )

(c) collector junction as well as emitter-based junction is reverse biased ( )

(d) emitter-based junction is reverse biased and collector junction is forward biased ( )

3. Class _____ operation gives the maximum distortion.

(a) A ( )

(b) B ( )

(c) C ( )

(d) AB ( )

4. An oscillator employs

(a) positive feedback ( )

(b) negative feedback ( )

(c) neither positive nor negative feedback ( )

(d) Data insufficient ( )

5. A MOSFET has _____ terminals.

(a) two ( )

(b) five ( )

(c) four ( )

(d) three ( )

SECTION—II

(*Marks* : 15)

Answer the following questions in brief : 3×5=15

1. What is an ideal diode? How does it differ from a real diode?

2. What are tunnel diode and LED?

3. Find the voltage gain in a CE amplifier, when the input resistance is 3 and the load resistance is 24 with 60.

4. Write a short note on Barkhausen's criterion for self-sustained oscillations.

5. Draw the diode detector circuit and explain its action.

★★★