

Nizam College (Autonomous)  
 Faculty of Science  
 B.SC. I- Semester Examinations, January - 2023  
 Physics : Paper – I  
 (Mechanics and Oscillations)

Time : 3 Hours

Max. Marks : 80

Section – A

I. Answer any EIGHT of the following questions.

[8 x 4 = 32]

1. Define divergence of a vector field with physical Significance.
2. Explain Multi Stage Rocket.
3. Define Impact Parameter and Scattering-Cross Section.
4. What are elastic and Inelastic Collisions with Suitable Examples.
5. What are the Postulates of Special theory of Relativity.
6. How much Energy could Theoretically be Destroyed by Annihilation of 1 gram of Matter.
7. A spring is Stretched by a mass of 1kg. If the Extension is 10cm. Calculate force Constant.
8. The Equation of SHO is  $x = 0.01 \sin 50(t + 0.007) m$ . Calculate Amplitude, time period and maximum Velocity.
9. Define Logarithmic Decrement and its Equation.
10. What are the characteristics of simple Harmonic Oscillator.
11. Define Lissajous Figures and its Applications.
12. Explain Length Contraction.

Section – B

II. Answer the following questions using internal choice.

[4 x 12 = 48]

13. (a) Define curl and derive an expression for Curl in terms of Cartesian Coordinates.

[OR]

(b) State and prove Green's theorem.

14. (a) Obtain an expression for Final Velocity of a Rocket at any given time.

[OR]

(b) What are Euler's Equations and Derive them.

15. (a) Derive an Equation of Motion under a Central Force.

[OR]

(b) From theory of Relativity Derive Lorentz's Transformation Equations.

16. (a) Define Torsional Pendulum and how to Determine Rigidity Modulus using it.

[OR]

(b) What are forced Harmonic Oscillations and derive Differential Equation with Solution.

Nizam College (Autonomous)

Faculty of Science

B.SC. I- Semester Examinations, May - 2023

Physics : Paper – 1

(Mechanics and Oscillations)

Time : 3 Hours

Max. Marks : 80

Section – A

I. Answer any EIGHT of the following questions.

[8 x 4 = 32]

1. Prove that the curl of gradient is zero.
2. Define curl of a vector field with suitable example.
3. What elastic and inelastic collisions with examples
4. Obtain an expression for kinetic energy of a rigid rotating body.
5. Show that the areal velocity remains constant under a central force.
6. What are Lissajous figures and mention their uses.
7. What are the Kepler's laws of planetary motion.
8. What are the postulates of special theory of relativity.
9. A particle executing SHM with  $x = 0.01 \sin 100(t + 0.005)m$  calculate amplitude, time period and maximum velocity.
10. A spring stretched by 8cm by a force of 10N. Find force constant.
11. Define Q-factor and band width of resonance.
12. Define damped harmonic oscillator and discuss under damped oscillations.

Section – B

II. Answer the following questions using internal choice.

[4 x 12 = 48]

13. (a) Show that  $\nabla^2(1/r) = 0$  where  $r$  is a position vector.  
[OR]  
(b) State and prove Gauss divergence theorem.
14. (a) Derive final velocities in case of elastic collisions in two Dimensional Collisions.  
[OR]  
(b) Define precessional velocity and derive an expression for precessional velocity of a top
15. (a) Show that the central forces are conservative and prove that conservative force is equal to negative of Potential Energy.  
[OR]  
(b) Describe Michelson-Morley experiment and derive an expression for fringe shift.
16. (a) Show that the power in damped harmonic Oscillator is  $2bE$ .  
[OR]  
(b) What is Q-factor and derive an expression for band width of Resonance.

\*\*\*\*\*

Nizam College (Autonomous)  
Faculty of Science  
B.SC. I- Semester Examinations, December - 2023  
Physics : Paper – 1  
(Mechanics and Oscillations)

Time : 3 Hours

Max. Marks : 80

Section – A

I. Answer any EIGHT of the following questions.

[8 x 4 = 32]

1. Define gradient of a vector field with suitable example.
2. Define line integral, surface integral and volume integral.
3. State Green's Theorem. Mention two applications.
4. Define impact parameter and scattering cross-section.
5. What elastic and inelastic collisions with examples.
6. Write a short note on Gyroscope.
7. A particle of mass 10kg rotates in a circle of radius with uniform angular velocity of 5rad/sec. Find the force acting on the particle.
8. Define absolute frame of reference.
9. How much energy could theoretically be destroyed by annihilation of 1 gram of matter.
10. Define damped harmonic oscillator and derive its differential equation.
11. Define Lissajous figured and its applications.
12. Define relaxation time with suitable mathematical equation.

Section – B

II. Answer the following questions.

[4 x 12 = 48]

13. (a) if a rigid body is rotating with angular velocity  $\omega$  about a fixed point. Prove that  $\omega = 1/2 \text{ curl } \mathbf{v}$  where,  $\mathbf{v}$  is linear velocity.  
[OR]  
(b) Define Curl of a vector field and derive Curl in terms of cartesian coordinates.
14. (a) What are Euler's equations and derive them.  
[OR]  
(b) Define precessional velocity and derive precessional velocity of a top.
15. (a) Derive Kepler's first law of planetary motion.  
[OR]  
(b) Derive Einstein's mass energy relationship.
16. (a) Draw Lissajous figures in linear combination of two mutually perpendicular Harmonic oscillators of different ratio.  
[OR]  
(b) Show that the power dissipation in damped harmonic oscillator is  $p=2bE$ .

\*\*\*\*\*

NIZAM COLLEGE (AUTONOMOUS)  
FACULTY OF SCIENCE  
B.SC. II- SEMESTER EXAMINATIONS, MAY – 2023  
PHYSICS : PAPER - 2  
(THERMAL PHYSICS)

TIME: 3 HOURS

MAX. MARKS: 80

SECTION – A

I. Answer any EIGHT of the following questions.

[8 x 4 = 32]

1. Determine R.M.S velocity of nitrogen molecules at S.T.P (density of  $N_2$  is  $1.25 \text{ gm/cm}^3$ )
2. Explain second law of thermodynamics.
3. A Carnot engine operates between 350 K and 275 K. It absorbs 500 J of heat. Calculate work derived by the engine.
4. Derive first and second Tds thermodynamic equations.
5. Derive an expression for amount of work done in adiabatic process.
6. Explain Joule – Thomson effect.
7. Obtain Wein's formula from Planck's radiation formula.
8. How temperature of sun is determined.
9. What are pyrometers and explain advantages and disadvantages.
10. Explain thermodynamic probability.
11. Discuss statistical equilibrium.
12. Explain the meanings of phase space and phase cells.

SECTION – B

II. Answer the following questions.

[4 x 12 = 48]

13. (a) Derive an expression for thermal conductivity of a gas.

[OR]

(b) Show that the change in entropy in a reversible cycle is zero and increases in irreversible cycle.

14. (a) What are Maxwell's potentials and derive Maxwell's thermodynamic relations.

[OR]

(b) Describe Joule – Thomson porous plug experiment and its importance.

15. (a) Derive Wein's and Rayleigh Jeans laws from Planck's law of radiation.

[OR]

(b) Explain the construction and working of disappearing filament optical pyrometer.

16. (a) Give the comparison of M-B, B-E and F-N statistics.

[OR]

(b) What is ensemble? Mention the differences between the microcanonical, canonicals and grand canonical ensembles.

\*\*\*\*\*

Code No. 23J/3S39/NC/Phy-SEC

Nizam College (Autonomous)

Faculty of Science

B.SC. III- Semester Examinations, January - 2023

Physics : SEC-2

(Biomedical Instrumentation)

Time : 2 Hours

Max. Marks : 40

Section – A

*I. Answer any FOUR of the following questions.*

[4 x 4 = 16]

1. Write a short note on fiber optic temperature sensors?
2. Explain dye dilution method for cardiac output measurement?
3. Write a short note on pulmonary function measurements?
4. Describe a spirometer with a suitable schematic diagram?
5. List different types of amplifiers used in bio-medical systems?
6. Discuss about imaging application in biomedical systems?
7. Write about ICCU patient monitoring system?
8. Explain briefly about advanced 3D surgical techniques?

Section – B

*II. Answer the following questions using internal choice*

[3 x 8 = 24]

9. (a) List and discuss briefly various types of transducers used for bio-medical applications?

[OR]

- (b) What is spirometry? What are the parameters determined with spirometer? Draw the block diagram and give clinical significance of parameters measured?

10. (a) Explain electrode tissue interface for surface electrodes. Also discuss electrode electrolyte interface?

[OR]

- (b) Explain the working principle of MRI scan with block diagram?

11. (a) Write a about Pacemakers and Defibrillators?

[OR]

- (b) What is Heart Lung Machine? Explain its working with constructional diagram?

\*\*\*\*\*

Time : 3 Hours

Max. Marks : 80

Section – A

I. Answer any EIGHT of the following questions.

[8 x 4 = 32]

1. Define and explain electric potential. Also define units of Potential.
2. Obtain the relation between electric potential and Electric Field.
3. Derive the relationship between flux density and field Intensity at a Point.
4. Define magnetic induction and Magnetic Flux.
5. Define curl and divergence of magnetic Field in Magnetostatics.
6. Write a note on Energy stored in Magnetic Field.
7. State and explain Lenz's law of Electromagnetic Induction.
8. Define the coefficient of mutual inductance between two coils and Mention its Units.
9. Write a note on Poynting's theorem.
10. Distinguish between an active and passive elements for Network theorems.
11. Explain the term 'Phase' as applied to an AC Circuit.
12. Obtain an expression for the growth of currents in CR Circuit.

Section – B

II. Answer the following questions using internal choice.

[4 x 12 = 48]

13. (a) State and Prove Gauss's law in Electrostatics.  
[OR]  
(b) Obtain an expression for the potential at a point due to a number of charges.  
Define Energy density in an Electric Field.
14. (a) State and Explain Biot-Savart's law? Discuss its Applications.  
[OR]  
(b) Find the force between two parallel wires carrying currents in the same Directions.
15. (a) What is Displacement Current?  
State the properties of electromagnetic waves travelling in free Space.  
[OR]  
(b) Discuss the propagation of electromagnetic waves in dielectrics. Derive expressions for field vectors and Phase Velocity.
16. (a) State and explain Superposition theorem with a Simple Problem.  
[OR]  
(b) Derive an expression for the current at any instant in LCR parallel Resonant Circuit.

Code No. 23D/3S39/NC/PHY -SEC

Nizam College (Autonomous)

Faculty of Science

B.SC. III- Semester Examinations, December - 2023

Physics : SEC-2

(Biomedical Instrumentation)

Time : 2 Hours

Max. Marks : 40

Section – A

I. Answer any **FOUR** of the following questions.

[4 x 4 = 16]

1. Explain how blood flow is measured.
2. Mention the factors that can cause in variation of blood pressure.
3. Write a short notes on differential amplifier.
4. Explain the principle involved in ultrasonography.
5. What is lithotrisp? Explain.
6. Enumarate the application of robotics in medical field.
7. Explain Einthoven triangle.
8. What is micro-current shock explain.

Section – B

II. Answer the following questions.

[3 x 8 = 24]

9. (a) Explain about different types of physiological signals and mention sources for physiological signals.  
[OR]  
(b) Why blood gas test is done? Explain about blood gas analyzer and pH of blood.
10. (a) Explain the different types of electrodes used to measure bioelectric events.  
[OR]  
(b) Write a detailed note on the ultrasonography.
11. (a) With a neat diagram explain the working of heart lung machine.  
[OR]  
(b) Draw block diagram and explain the basic principle of computer tomograph.

\*\*\*\*\*

NIZAM COLLEGE (AUTONOMOUS)

FACULTY OF SCIENCE

B.S.C. IV- SEMESTER EXAMINATIONS, MAY – 2023

PHYSICS : PAPER - IV

TIME: 3 HOURS

MAX. MARKS: 80

SECTION – A

I. Answer any EIGHT of the following questions.

[8 x 4 = 32]

- 1) What is a wave motion? What are transverse and longitudinal waves?
- 2) Write a note on the energy transport in a wave motion.
- 3) Deduce an expression for the velocity of transverse waves in a string.
- 4) Explain the phenomenon of interference of light and define interference.
- 5) What are coherent sources? What are the conditions for two sources to be coherent?
- 6) What is Non-reflecting film.? Explain it.
- 7) What is diffraction? Explain the difference between interference and diffraction.
- 8) Distinguish between Fresnel and Fraunhofer type of diffraction.
- 9) Explain the construction of Fresnel's half period zones on a plane wave front.
- 10) State and explain Malus law.
- 11) What is double refraction? Give Huygen's theory of double refraction.
- 12) What is the difference between negative and positive crystals?

SECTION – B

II. Answer the following questions using internal choice.

[4 x 12 = 48]

13. (a) Derive an wave equation for the longitudinal vibrations in bars and obtain its general solution. Discuss few special cases also.

[OR]

- (b) Obtain the wave equation for the transverse vibrations in bars and find its general solution. Discuss the boundary conditions also.

14. (a) Explain briefly about Fresnel's biprism experiment with neat diagram.

[OR]

- (b) Describe the construction and working of Michelson's interferometer.

15. (a) Explain in detail diffraction due to single slit and circular aperture with neat diagram.

[OR]

- (b) What is a zone plate? What are positive and negative zone plates? Compare zone plate with convex lens.

16. (a) Describe the construction and action of Nicol prism. Mention Drawbacks of Nicol prism.

[OR]

- (b) Explain the working of Babinet's compensator. Why this device is superior to quarter wave plate?

Code No. 23J530/GE/NC /PHY

Nizam College (Autonomous)

Faculty of Science

B.SC. V- Semester Examinations, January - 2023

Physics : General Elective  
(Renewable Energy Resources)

Time : 3 Hours

Max. Marks : 80

Section – A

*I Answer any EIGHT of the following questions.*

[8 x 4 = 32]

1. What are the forms and sources of energy? List some reasons why non-renewable energy sources are preferred?
2. Define solar constant? What are the instruments used to measure solar radiation? Explain.
3. Explain the environmental impact of solar power
4. Write a short note on materials for flat plate collector
5. Describe solar distillation and drying
6. Explain solar ponds briefly
7. Differentiate between bio-mass and bio gas
8. What are bio-gas digesters? Classify them?
9. What methods are used to overcome the fluctuating power generation of a windmill?
10. Why the efficiency of OTEC systems is less than 5%?
11. What is geothermal energy? What are the sources of geothermal energy?
12. List wave energy conversion devices? Describe one of them?

Section – B

*II. Answer the following questions using internal choice.*

[4 x 12 = 48]

13. (a) Describe the model of conventional thermal power plant.  
[OR]  
(b) Discuss the role and potential of new and renewable energy sources.
14. (a) Write in detail about solar concentrating collector.  
[OR]  
(b) What is the principle of photovoltaic conversion of solar energy? Explain their advantages and disadvantages?
15. (a) Explain the working of vertical axis wind mill with suitable diagram.  
[OR]  
(b) Explain the gas yield, combustion characteristics of bio-gas? Write a short note on LPG.
16. (a) Explain with sketches the various methods of tidal power generation? What are the limitations.  
[OR]  
(b) What is ocean energy? What are the sources of ocean energy? Explain the methods of harnessing the energy?

\*\*\*\*\*

CODE NO: 23M/530/NC/CBCS/PHY-6-B/L

NIZAM COLLEGE (AUTONOMOUS)  
FACULTY OF SCIENCE  
B.Sc. V-SEMESTER EXAMINATIONS MAY-2023  
PHYSICS : PAPER -6  
(E-2) : ELEMENT OF MODERN PHYSICS

TIME: 2 HOURS]

[Max. MARKS=40]

I. ANSWER THE FOLLOWING QUESTIONS

[4x3=12]

1. Define matter wave and obtain the equation for the wavelength of matter waves.
2. Find the ground state energy of an electron confined in a potential box of length 0.1 nm.
3. Write the properties of nuclear forces.
4. Discuss the spectrum of beta-decay.

SECTION-B

II. ANSWER THE FOLLOWING QUESTIONS USING INTERNAL CHOICE

[4x7=28]

5. (a) Describe the Davisson and Gerners experiment for the confirmation of existence of matter waves.

[OR]

- (b) Discuss the Bohrs theory of Hydrogen atom and obtain electron energy levels in hydrogen atom.

6. (a) Obtain Schrödinger time independent wave equation.

[OR]

- (b) Discuss the energy levels of a particle confined in a potential box of length 'L'.

7. (a) Write semi-empirical mass formula and explain various terms of it.

[OR]

- (b) Explain the assumptions of liquid drop model to stability of the nucleus.

8. (a) Explain the laws of radioactive disintegration.

[OR]

- (b) Describe the working of nuclear reactor with suitable diagram.

\*\*\*\*\*

Nizam College (Autonomous)  
Faculty of Science  
B.SC. V- Semester Examinations, December - 2023  
Physics : Paper – V  
(Modern Physics)

Time : 3 Hours

Max. Marks : 80

Section – A

[8 x 4 = 32]

I. Answer any EIGHT of the following questions.

1. Explain the selection rules for spectral lines.
2. Write note on L-S and J-J coupling.
3. Write a short note on Zeeman Effect.
4. Mention the postulates of quantum mechanics.
5. Obtain the uncertainty relation between energy and time.
6. Calculate the de-Broglie wavelength of an electron with velocity  $10^6$  m/s.
7. Deduce the relation between nuclear radius and mass number of nuclei.
8. Classify the  $\beta$ -decay and explain.
9. Write note on magnetic dipole moment of nucleus.
10. Define space lattice and unit cell.
11. Write a note on Miller indices.
12. The first order maxima obtained at the angle of  $30^\circ$  for a crystal with interplanar spacing  $0.91^\circ \text{A}$  with  $\lambda = 1.1^\circ \text{A}$ , When  $\lambda = 1.4^\circ \text{A}$  is used to get the maxima, what is the interplanar spacing.

Section – B

[4 x 12 = 48]

II. Answer the following questions.

13. (a) Explain the classical theory of Raman effect.  
[OR]  
(b) Discuss the doublet fine structure of spectrum of alkali atoms.
14. (a) Define Compton effect and describe an experiment for the verification of Compton effect.  
[OR]  
(b) Obtain the Schrodinger time independent wave equation.
15. (a) Describe the principle and working of GM counter.  
[OR]  
(b) Explain the Liquid drop model in detail.
16. (a) Define lattice energy and derive an expression for lattice energy of an ionic crystal.  
[OR]  
(b) Explain the principle and working of powder X-ray diffraction method.

\*\*\*\*\*

NIZAM COLLEGE (AUTONOMOUS)  
FACULTY OF SCIENCE  
B.SC. VI- SEMESTER EXAMINATIONS, MAY – 2023  
PHYSICS : PAPER - VI

TIME: 3 HOURS

MAX. MARKS: 80

SECTION – AI. Answer any *EIGHT* of the following questions.

[8 x 4 = 32]

1. Give the energy band description of conductors, semiconductors and insulators.
2. Write a note on pure and impure semiconductors.
3. Discuss the effect of temperature on semiconductors.
4. Write a short note on zener diode.
5. Compare the three transistor connections.
6. Draw and explain the PNP and NPN transistors.
7. Explain the working of Shockley diode.
8. Write a short note on Photo diode.
9. Give two applications of Solar cell with examples.
10. Explain the three basic logic gates using discrete components.
11. How will you make decimal to hexadecimal conversion and vice-versa.
12. Explain binary addition and subtraction using 1's and 2's complement methods.

SECTION – B

II. Answer the following questions using internal choice.

[4 x 12 = 48]

13. (a) Draw and Explain the V-I characteristics of a PN junction diode.  
[OR]  
(b) Derive an expression for the efficiency of a full-wave bridge rectifier with diagrams.
14. (a) Draw the circuit of a practical RC coupled amplifier. Explain its Frequency response.  
[OR]  
(b) Draw and explain the circuit of a Phase Shift Oscillator.
15. (a) Explain the construction and working of Silicon Controlled Rectifier (SCR).  
[OR]  
(b) Describe the action of a Field Effect Transistor (FET) as an Amplifier.
16. (a) What are universal gates. Construct all logic gates using NAND gate.  
[OR]  
(b) State and prove De Morgan's theorems with truth tables.

\*\*\*\*\*

CODE NO: 23M/630/NC/CBCS/PHY-7-B/L

NIZAM COLLEGE (AUTONOMOUS)  
FACULTY OF SCIENCE  
B.Sc. VI-SEMESTER EXAMINATIONS MAY-2023  
PHYSICS : PAPER -7  
(BASICS OF ELECTRONICS)

[TIME: 2 HOURS]

[Max. MARKS=40]

I. ANSWER THE FOLLOWING QUESTIONS

[4x3=12]

1. Write Maxwells equations in the differential form.
2. Define power factor and mention its physical significance.
3. Classify the solids on the based on the band theory.
4. Define feedback and explain the advantages of feedback in electronic circuits.

SECTION-B

II. ANSWER THE FOLLOWING QUESTIONS USING INTERNAL CHOICE

[4x7=28]

5. (a) Derive plane electromagnetic wave equation.

[OR]

- (b) Prove the transverse nature of electromagnetic waves.

6. (a) Discuss the working of LCR series circuit.

[OR]

- (b) Discuss nature of growth of current in LR circuit

7. (a) Explain the working of full-wave rectifier with required circuit.

[OR]

- (b) Discuss the various current components in a transistor.

8. (a) Explain how a transistor work as an amplifier.

[OR]

- (b) State and prove DeMorgans theorems.

\*\*\*\*\*