S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade , Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA – 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email : svkp_penugonda@rediffmail.com Website : svkpandksrajucollege.edu.in

I B.Sc., I –SEMESTER COURSE-I SYLLABUS

W.E.F AY 2025-26 Admitted Batch

SEMESTER-I

COURSE-1: INTRODUCTION TO MATHEMATICAL PHYSICS

Theory **Credits: 3** **3 hr. /week**

COURSE OBJECTIVE:

To equip students with foundational mathematical techniques—such as vector calculus, linear algebra, complex numbers, probability, and Fourier analysis—essential for understanding and solving problems in physics.

LEARNING OUTCOMES:

After successful completion of the course, students will be able to:

- Apply concepts of vector differentiation and integration to analyze physical fields and prove integral theorems.
- Use matrix operations and eigenvalue techniques to solve linear systems in physics.
- Represent and manipulate complex numbers in various forms for solving AC circuit problems.
- Interpret and apply basic probability concepts and distributions to model physical phenomena.
- Analyze periodic signals using Fourier series and evaluate Fourier coefficients for common waveforms.

UNIT-I - VECTOR ANALYSIS - (9. Hrs.)

Distinction between Ordinary and partial derivatives, Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

UNIT-II – LINEAR ALGEBRA- (9. Hrs.)

Vector and Scalar quantities in Physics, Matrices and Operations: Types, Addition and Multiplication, Identity and Inverse, Determinant (2x2 and 3x3), Trace, Transpose, Eigenvalues and Eigen Vectors, Calculation of Eigen values using characteristic equations. System of Linear Equations: Solving 2- variable system using matrices, Simple examples from physics (Current, forces)

UNIT – III COMPLEX NUMBER- (9. Hrs.)

Basic Complex numbers: Real and imaginary parts, Conjugate of complex numbers, Modulus and argument (magnitude and phase), Polar and Exponential (Euler) form of complex numbers. Addition and subtraction of complex numbers, Multiplication and division of complex numbers. Phasor representation: representation of voltage and current as phasors, Derivation of Impedance of a series LCR circuit.

UNIT – IV PROBABILITY - (9. Hrs.)

Probability Theory Basics, Sample space, events, conditional probability, and Bayes' theorem. Independence and mutual exclusivity. Random Variables and Probability Distributions, Concept of random variables (discrete and continuous). Common distributions and their applications: Binomial, Poisson, and Gaussian.

UNIT V FOURIER ANALYSIS - (9. Hrs.)

Introduction to periodic functions: Concept of periodicity (waves, oscillations, AC current), Graphical understanding of Sine and Cosine functions, Need for Fourier analysis, Real world signals (heartbeat, electrical signal, musical tones), Fourier theorem ad evaluation of Fourier coefficients, Analysis of periodic wave functions – Square wave, saw tooth wave and triangular wave.

Reference books

1. Mathematical methods for physics sciences (3rd edition) - Mary. L. Boas
2. First Chapter (Vector analysis) in Introduction to Electrodynamics (3rd edition) – David. J. Griffiths
3. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier

S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade, Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA – 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email : svkp_penugonda@rediffmail.com Website : svkpandksrajucollege.edu.in

S.V.K.P. & Dr.K.S.RAJU A & S COLLEGE (A), PENUGONDA-534320.

I B.Sc. – PHYSICS –SEMESTER-1, COURSE - 1 (MAJOR-1)

INTRODUCTION TO MATHEMATICAL PHYSICS (25PHY11)

w.e.f. 2025–26 admitted batch

MODEL PAPER

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

Answer any FIVE questions from Section-A and Section-B choosing atleastTwo questions from each section.

Each Question carries 8 marks. **5x8=40Marks**

SECTION-A

1. State and prove Gauss divergence theorem.
2. State and prove Stokes theorem.
3. Solve $3x+y = -10$, $x-2y = 4$ two variable system using matrices.
4. Find the characteristic roots and corresponding characteristic vectors of the matrix

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

5. Convert (-4+4i) in polar form of complex numbers.

SECTION-B

6. Derive impedance of a series LCR circuit.
7. A random variable X has the following probability distribution.

X (= x_i)	1	2	3	4
P (X=x_i)	k	2k	3k	4k

then find (a) k, (b) P(X<3), (c) P(X≥3), (d) Mean, (e) Standard deviation.

8. State and prove Bayes theorem.
9. State Fourier theorem and derive Fourier coefficients.
10. Analyze Square wave by using Fourier's theorem.

SECTION-C

Answer any FIVE Questions. **5x4=20 Marks**

11. Explain physical significance of divergence.
12. Show that div (curl A) = 0.
13. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$ then find AB and BA.
14. Find the determinant of a matrix $A = \begin{bmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ 1 & 1 & 3 \end{bmatrix}$
15. Find the real and imaginary part of the complex number $\frac{2+5i}{2-5i}$.

16. If $Z_1 = -1$ and $Z_2 = i$ then find the value of argument (Z_1Z_2)

17. Three cards are drawn at random from a pack. Find the probability that they are a King, a Queen and a Jack.

18. Explain the concept of periodicity.

S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade , Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA – 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email : svkp_penugonda@rediffmail.com Website : svkpandksrajucollege.edu.in

I -Semester PHYSICS Major -2

SEMESTER- I

COURSE 2: MECHANICS AND PROPERTIES OF MATTER

Theory **Credits: 3** **3 hr. /week**

COURSE OBJECTIVE:

To provide students with a foundational understanding of classical mechanics and the physical properties of matter, including particle dynamics, central forces, elasticity, fluid behavior, and the basic principles of special relativity.

LEARNING OUTCOMES: After successful completion of the course, students will be able to:

- Apply Newton's laws to variable mass systems and analyze particle collisions using conservation laws and scattering theory.
- Describe motion under central forces and derive orbital dynamics including Kepler's laws and satellite motion.
- Explain elastic behavior of materials using stress-strain relations, and analyze the bending of beams and torsional motion.
- Interpret fluid dynamics concepts such as streamline flow, Bernoulli's principle, and viscosity with practical applications.
- Understand the key postulates of special relativity and apply Lorentz transformations to problems involving time dilation, length contraction, and mass-energy equivalence.

UNIT-I MECHANICS OF PARTICLES - *(9 hrs.)*

Newton's Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, collisions in two and three dimensions, concept of impact parameter, scattering cross-section, Rutherford scattering-derivation

UNIT-II CENTRAL FORCES - *(9 hrs.)*

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion under a central force, derivation of Kepler's laws, motion of satellites, Geo-stationary satellites

UNIT III: ELASTICITY AND BENDING OF BEAMS - *(9 hrs.)*

Stress and strain, Hooke's Law, Elastic moduli – Young's, bulk, and shear modulus, Poisson's ratio – Physical meaning, Bending of beams – Types, point and distributed load, Cantilever and uniform bending – Qualitative treatment, Torsional pendulum – working principle and uses.

UNIT IV: FLUID MECHANICS -*(9 hrs.)*

Fluids – Properties and classification, Streamline vs turbulent flow, Reynolds number, Bernoulli's theorem – Statement, simple derivation and applications (Venturimeter, airplane lift), Equation of continuity – Concept, Viscosity – Poiseuille's law (statement and qualitative explanation), Surface tension – Examples and qualitative ideas

UNIT V: SPECIAL THEORY OF RELATIVITY- *(9 hrs.)*

Galilean relativity, absolute frames, Michelson-Morley experiment, negative result, postulates of special theory of relativity, Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.

REFERENCE BOOKS:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi
3. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra
4. Properties of Matter - D.S. Mathur, S. Chand & Co, New Delhi ,11th Edn., 2000
5. Physics Vol. I - Resnick-Halliday-Krane ,Wiley, 2001
6. Properties of Matter – Brijlal & Subrmanyam, S. Chand & Co. 1982
7. Mechanics-EM Purcell, Mc Graw Hill
8. University Physics-FW Sears, MW Zemansky & HD Young, Narosa Publications, Delhi
9. College Physics-I. T. Bhima sankaram and G. Prasad. Himalaya Publishing House.
10. Mechanics, S. G. Venkata chalapathy, Margham Publication, 2003.
11. Fluid Mechanics – Frank M. White, McGraw Hill.
12. Textbook of Fluid Dynamics – M. D. Raisinghania, S. Chand & Co.

S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade , Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA – 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email : svkp_penugonda@rediffmail.com Website : svkpandksrajucollege.edu.in

S.V.K.P.& Dr. K. S. RAJU A & S COLLEGE (A), PENUGONDA-534320.
I B.Sc. – PHYSICS –SEMESTER-1, COURSE - 2 (MAJOR-2) MECHANICS AND PROPERTIES OF MATTER (25PHY12)
w.e.f. 2025–26 admitted batch
MODEL PAPER

Answer any **FIVE** questions from Section-A and Section-B choosing at least Two questions from each section.
Each Question carries 8 marks. 5x8=40Marks

SECTION-A

1. Derive an expression for the final velocity of the rocket.
2. Derive an expression for Rutherford's scattering angle.
3. Define central force. Show that central force is conservative force.
4. Derive Kepler's first law of planetary motion.
5. Explain about Elastic moduli.

SECTION-B

6. Explain the working principle of Torsional pendulum.
7. Explain Bernoulli's theorem.
8. State and explain Poiseuille's law.
9. Describe Michelson and Morley experiment with a neat sketch.
10. Derive Lorentz transformation equations.

SECTION-C

Answer any **FIVE** Questions. 5x4=20 Marks

11. Define impact parameter and scattering cross section.
12. An empty rocket weighs 6000 kg and contains 44000 kg of fuel. If the exhaust velocity of gases is 1 km/s. Find the maximum velocity attained by the rocket.
13. Write about Geostationary satellites.
14. If the earth be one-half of its present distance from the Sun, what will be the number of days in a year?
15. Write a short note on types of beams.
16. Explain equation of continuity.
17. Explain length contraction.
18. The mean life of a meson is 2×10^{-8} sec. Calculate the mean life of a meson moving with a velocity of 0.8C.

S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade , Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA – 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email : svkp_penugonda@rediffmail.com Website : svkpandksrajucollege.edu.in

I B. Sc. Physics (MAJOR): Semester-II Major-3

(w.e.f. 2025-26 admitted batch)

SEMESTER-II

COURSE-3: WAVES AND OPTICS

Theory **Credits: 3** **3 hrs. /week**

COURSE OBJECTIVE:

The course aims to develop a foundational understanding of oscillatory motion, wave behavior in strings and bars, and optical phenomena like interference, diffraction, and polarization. Students will learn to mathematically analyze vibrations and light behavior through theoretical and experimental approaches.

LEARNING OUTCOMES:

On successful completion of this course, the students will be able to:

- Describe the basic characteristics of waves such as frequency, wavelength, amplitude, period, and speed and utilize mathematical relationships related to wave characteristics.
- Distinguish between Longitudinal and Transverse waves.
- Understand the phenomenon of interference of light and its formation in thin films and Newton's rings.
- Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating and to describe the construction and working of zone plate and make the comparison of zone plate with convex lens
- Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.

UNIT-I: SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS- (9 Hrs.)

Simple Harmonic Oscillator: Solution of differential equation, and physical characteristics, Principle of superposition, Combination of two mutually perpendicular SHMs (1:1 and 1:2 frequencies), Lissajous figures. Damping, Damped Harmonic Oscillator: Solution of differential equation, Energy considerations, Logarithmic decrement, relaxation time, quality factor, Forced Oscillations: Solution of differential equation.

UNIT-II VIBRATING STRINGS AND BARS- (9 hrs)

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance. Longitudinal vibrations in bars-wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint (iii) bar fixed at one end. Tuning fork.

UNIT-III: INTERFERENCE- (9 hrs)

Principle of superposition – coherence Conditions for interference of light. Fresnel's biprism determination of wavelength of light, change of phase on reflection, Oblique incidence of a plane wave on a thin film due to reflected light (cosine law) –colors of thin films- Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film). Determination of diameter of wire, Newton's rings in reflected light. Determination of wavelength of monochromatic light using Newton's rings.

UNIT-IV: DIFFRACTION- (9 hrs.)

Introduction, distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction – Diffraction due to single slit, Fraunhofer diffraction pattern with N slits (diffraction grating), Resolving power of grating, Determination of wavelength of light in normal incidence using diffraction grating. Fresnel's half period zones-area of the half period zones-zone plate, Difference between interference and diffraction.

UNIT-V: POLARIZATION- (9 hrs.)

Polarized light: methods of polarization by reflection, refraction, double refraction, Brewster's law, Mauls law, Nicol prism polarizer and analyzer, Quarter wave plate, Half wave plate, optical activity - Determination of specific rotation by Laurent's half shade Polarimeter. Idea of elliptical and circular polarization

REFERENCE BOOKS:

1. BSc Physics Vol.1, Telugu Academy, Hyderabad.
2. BSc Physics Vol.2, Telugu Akademy, Hyderabad
3. Fundamentals of Physics. Halliday/Resnick/Walker, Wiley India Edition 2007.
4. Waves & Oscillations. S. Badami, V. Balasubramanian and K.R. Reddy, Orient Longman.
5. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
6. Optics – Ajoy Ghatak, Tata McGraw Hill
7. Fundamentals of Optics – Jenkins and White, McGraw Hill
8. Wave Optics and Vibrations – N. Subrahmanyam & Brijlal, S. Chand & Co.
9. Vibrations and Waves – H. J. Pain, Wiley

S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade, Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA - 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email : svkp_penugonda@rediffmail.com Website : svkpandksrajucollege.edu.in

S.V.K.P. & Dr. K. S. RAJU A & S COLLEGE (A), PENUGONDA-534320.

I B.Sc. – PHYSICS –SEMESTER-2, COURSE - 3 (MAJOR-3)

WAVES AND OPTICS (25PHY21)

w.e.f. 2025 -26 admitted batch

MODEL PAPER

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

Answer any FIVE questions from Section A and B choosing at least Two from each section

Each question carries 8 marks **5 x 8 = 40 Marks**

SECTION – A

1. Derive the equation of a combination of two mutually perpendicular simple harmonic vibrations of same frequency.
2. Derive the differential equation of a damped harmonic oscillator and obtain it's solution.
3. Derive the equation for velocity of transverse wave propagation along a stretched string.
4. Derive the equation for longitudinal vibrations in a bar fixed at both ends.
5. Explain Fresnel's biprism experiment for determination of wavelength of light.

SECTION – B

6. Explain about the determination of wavelength of monochromatic light using Newton rings experiment.
7. Explain Fraunhoffer diffraction due to single slit and draw intensity distribution curve.
8. Explain construction & working of a zone plate and derive formula for focal length of it.
9. Describe the construction and working of a Nicol's prism.
10. Determine the specific rotation of a given liquid by using Laurent's half shade polarimeter.

SECTION – C

Answer any FIVE questions **5 x 4= 20 Marks**

11. Write a short note on Lissajous figures.
12. The Q- factor of an oscillator is 500. Fine it's initial energy if it's amplitude is 0.01m. also calculate the energy lost in first cycle. Given $S = m\omega^2 = 100$ N/m.
13. Write a short note on overtones and harmonics.
14. Write the conditions for interference of light.

15. In a Newton's rings experiment the diameter of the 10^{th} dark ring formed by yellow sodium light of wavelength 5.89×10^{-7} m and seen in reflection is 3×10^{-3} m. What is the radius of curvature of the lens?
16. Distinguish between Fresnel and Fraunhoffer diffraction.

17. State and explain Brewster's law.
18. Calculate the thickness of a half wave quartz plate to be used with sodium light $\lambda = 5893 A^0$, $\mu_0 = 1.544$ & $\mu_e = 1.533$.

S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade , Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA – 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email : svkp_penugonda@rediffmail.com Website : svkpandksrajucollege.edu.in

I B.Sc.: Physics Semester-II Course-4 (MAJOR)

(w.e.f. 2025-26 admitted batch)

SEMESTER-II

COURSE-4: HEAT AND THERMODYNAMICS

Theory **Credits: 3** **3 hrs./week**

COURSE OBJECTIVE:

The course on Heat and Thermodynamics aims to provide students with a fundamental understanding of the principles of heat and energy transfer and their applications in various fields.

LEARNING OUTCOMES:

On successful completion of this course, the student will be able to:

- Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzmann distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases
- Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations. Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency
- Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
- Differentiate between principles and methods to produce low temperature, liquefy air, and understand the practical applications of substances at low temperatures.
- Examine the nature of black body radiations and the basic theories.

UNIT-I: KINETIC THEORY OF GASES - (9 hrs)

Kinetic Theory of gases- Introduction, Maxwell's law of distribution of molecular velocities, Lammert's toothed wheel method; Mean free path, Principle of equipartition of energy, Transport phenomenon in ideal gases: viscosity and Thermal conductivity.

UNIT-II: THERMODYNAMICS - (9 hrs)

Introduction- Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Thermodynamic scale of temperature, Second law of thermodynamics Entropy: Physical

significance, change in entropy in reversible and irreversible processes; Change of entropy when ice changes into steam. Temperature- Entropy (T-S) diagram and its uses.

UNIT-III: THERMODYNAMIC POTENTIALS AND MAXWELL'S EQUATIONS- (9 hrs)

Thermodynamic Potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Clausius-Clayperon's equation, Joule-Kelvin coefficient for ideal and Van der Waals' gases.

UNIT-IV: LOW TEMPERATURE PHYSICS - (9 hrs)

Methods for producing very low temperatures, Critical temperature, Inversion temperature, Joule Kelvin effect, porous plug experiment, Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Expression for Joule Thomson cooling, Production of low temperatures by adiabatic demagnetization (qualitative), Refrigeration – apour compression machine.

UNIT-V: QUANTUM THEORY OF RADIATION - (9 hrs)

Black body, Ferry's black body, Spectral energy distribution of black body radiation, Wein's displacement law and Rayleigh- Jean's law (No derivations), Planck's law of black body radiation-Derivation, Deduction of Wein's law and Rayleigh- Jean's law from Planck's law, Solar constant and its determination using Angstrom pyro heliometer, Estimation of surface temperature of Sun.

REFERENCE BOOKS

1. BSc Physics, Vol.2, Telugu Akademy, Hyderabad
2. Thermodynamics, R.C. Srivastava, S.K. Saha & Abhay K. Jain, Eastern Economy Edition.
3. Unified Physics Vol.2, Optics & Thermodynamics, Jai Prakash Nath & Co. Ltd., Meerut
4. Fundamentals of Physics. Halliday/Resnick/Walker. C. Wiley India Edition, 2007
5. Heat and Thermodynamics - N BrijLal, P. Subrahmanyam, S. Chand & Co., 2012
6. Heat and Thermodynamics - MS Yadav, Anmol Publications Pvt. Ltd, 2000
7. University Physics, HD Young, MW Zemansky, FW Sears, Narosa Publishers, New Delhi

S.V.K.P & Dr. K.S. RAJU ARTS & SCIENCE COLLEGE (Autonomous)
Accredited by NAAC with "A" Grade, Recognized by UGC as "College with Potential for Excellence"
ISO Certified Institution (with 3 ISO Certificates)
(Affiliated to ADIKAVI NANNAYA UNIVERSITY - Recognized by Govt. of Andhra Pradesh)
PENUGONDA – 534320. W.G.DIST.A.P
Phone No: 08819-246126 Email: svkp_penugonda@rediffmail.com Website: svkpandksrajucollege.edu.in

S.V.K.P. & Dr. K. S. RAJU A & S COLLEGE (A), PENUGONDA-534320.

I B.Sc. – PHYSICS –SEMESTER-2, COURSE - 4 (MAJOR-2)

HEAT AND THERMODYNAMICS (25PHY22)

w.e.f. 2025 -26 admitted batch

Time: 3 Hours **MODEL PAPER** **Max. Marks: 60**

Answer any FIVE questions from Section A and B choosing at least Two from each section Each question carries 8 marks **5 x 8 = 40 Marks**

SECTION – A

1. Derive an expression for Maxwell's law of distribution of molecular velocities in a gas.
2. Derive an expression for coefficient of thermal conductivity on the basis of kinetic theory of gases.
3. Explain the working of a Carnot's engine and obtain an expression of its efficiency.
4. What is Entropy? Explain its physical significance and calculate change in entropy in a reversible process.
5. What are thermodynamic potentials? Derive Maxwell's thermodynamic relations using thermodynamic potentials.

SECTION – B

6. What is Joule - Kelvin effect? Derive Joule - Kelvin coefficient for an ideal gas.
7. Derive an expression for Joule- Thomson cooling and write it's three cases.
8. Describe the theory of adiabatic demagnetization process for production of very low temperatures.
9. Write Planck's hypothesis and Derive Planck's law of black body radiation.
10. Define Solar constant and explain how it can be determined experimentally?

SECTION – C

Answer any FIVE questions **5 x 4= 20 Marks**

11. Explain transport phenomena in gases.
12. State and explain Second law of thermodynamics.
13. Calculate the efficiency of a reversible heat engine working between 72^{0}C and 187^{o}C.
14. Derive Clausius – Clayperon's equation.
15. Write a short note on vapour compression machine.
16. Calculate the inversion temperature of Helium gas. Given a = 3.44×10^{-3} newton-m^4/mol^2, b = 0.0237×10^{-3} m^3/ mol and R = 8.31 Joule/(mol-K).
17. Explain how the temperature of Sun is estimated?
18. The Luminosity of a star is 20,000 times that of the Sun. If the surface temperature of Sun is 6000 K, find the surface temperature of Sun star?

APPROVED BY