

(7305PHY20)

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET

4TH YEAR B.Sc. HONORS WITH RESEARCH

PHYSICS, VII Semester, Paper 7.5

MATERIALS SCIENCE

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. Derive Gibbs-Thomson equation?
2. Explain Melt growth technique?
3. Write about the classification of Nanomaterials?
4. Write a short note on Quantum dots?
5. Write size dependent physical properties of semiconductor nanoparticles?
6. Write a short note on Quantum confinement?
7. Differentiate between Type-I and Type-II super conductors?
8. Write about the tools of green chemistry?

SECTION – B

Answer any FIVE of the following (5 x 8 = 40 Marks)

9. (a) Explain Czochralski crystal growth technique?
or
(b) Explain Vapour deposition crystal growth technique?
10. (a) Discuss about the Top-down and Bottom-up synthesis of Nanoparticles?
or
(b) Explain Sol-Gel method for producing nanomaterials?
11. (a) Explain Quantum confinement of Semiconductor nano structures?
or
(b) Write a short note on LEDs and Solar cells?
12. (a) What is Hysteresis? Explain its B-H curve?
or
(b) Explain the different types of dielectric polarization?
13. (a) Explain the principles of green chemistry?
or
(b) What are ionic liquids? Explain types and synthesis of ionic liquids?

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET
4TH YEAR B.Sc. HONORS WITH RESEARCH

PHYSICS, VII Semester, Paper 7.2

RESEARCH METHODOLOGY: OBSERVATIONAL AND EMPIRICAL PERSPECTIVES

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. Write difference between Probability and Non-Probability sampling?
2. Explain Quota sampling?
3. Explain the rules of tabulation in data presentation?
4. Write the difference between Univariate and Bivariate?
5. Write about t-test?
6. Explain the sampling error?
7. Explain the secondary data?
8. Explain the principles of data interpretation?

SECTION – B

Answer any FIVE of the following (5 x 8 = 40 Marks)

9. (a) Define Sampling? Explain the characteristics of good sample?
or
(b) Explain the methods of Probability sampling?
10. (a) What are the methods for collecting primary data?
or
(b) Explain Editing and discuss the guidelines for editing?
11. (a) Explain the data transformation and its benefits?
or
(b) Explain t-test and F-test?
12. (a) Explain the data analysis and its methods?
or
(b) Explain the data interpretation?
13. (a) Explain the format of research report?
or
(b) Explain the preparation of bibliography?

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE (A), SULLURPET
FOUR YEAR B.Sc., HONOURS (CBCS) EXAMINATION, OCTOBER 2025
THIRD SEMESTER, PHYSICS MAJOR
COURSE 5: OPTICS

Time: 2 ½ Hours

Max. Marks: 60

SECTION – A**Answer any five of the following questions****5 × 4 = 20 Marks**

1. Explain spherical aberration with neat diagram. How can it be minimized?
2. What are achromatic doublets? Explain their significance.
3. Explain the working of Fresnel's Biprism experiment for determining the wavelength of light.
4. Write a short note on colors in thin films.
5. Differentiate between interference and diffraction.
6. Explain the construction and use of a zone plate.
7. What are quarter wave and half wave plates?
8. Write a short note on holography and its applications.

SECTION – B**Answer all the following questions****5 × 8 = 40 Marks**

9. (a) What is astigmatism? Explain its correction methods.
OR
(b) Derive the condition for achromatism of two lenses in contact.
10. (a) Explain interference in wedge-shaped thin films. Obtain an expression for fringe width.
OR
(b) Describe the formation of Newton's Rings and explain how wavelength of light can be determined.
11. (a) Derive the intensity distribution for Fraunhofer diffraction due to a single slit.
OR
(b) Explain the resolving power of a diffraction grating with derivation.
12. (a) Explain Brewster's law and discuss polarization by reflection.
OR
(b) Explain the construction and working of Laurent's half-shade polarimeter.
13. (a) Explain the principle, construction, and working of He-Ne LASER with applications.
OR
(b) Describe the principle of holography and explain the process of recording and reconstruction of holograms.

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE (A), SULLURPET
FOUR YEAR B.Sc., HONOURS (CBCS) EXAMINATION, OCTOBER 2025
THIRD SEMESTER – PHYSICS MAJOR
COURSE 7: ELECTRONIC DEVICES AND CIRCUITS

Time: 2 ½ Hours

Max. Marks: 60

SECTION – A

Answer any five of the following questions

5 × 4 = 20 Marks

1. Define and explain the concept of depletion region in a P-N junction diode.
2. Write short notes on Zener diode applications.
3. Explain the active, cutoff, and saturation regions of a BJT.
4. Write a note on thermal runaway in transistors.
5. Differentiate between JFET and MOSFET.
6. Explain the V-I characteristics of UJT.
7. Write the construction and applications of a Light Dependent Resistor (LDR).
8. Explain the concept of ripple factor in rectifiers.

SECTION – B

Answer all the following questions

5 × 8 = 40 Marks

9. (a) Explain the forward and reverse bias characteristics of a P-N junction diode with diagrams.
OR
(b) Explain the construction, working, and V-I characteristics of a Tunnel diode.
10. (a) Explain the input and output characteristics of a transistor in CE configuration.
OR
(b) Describe different transistor biasing techniques and the need for stabilization.
11. (a) Explain the construction and working of depletion and enhancement type MOSFETs.
OR
(b) Explain the construction, working, and V-I characteristics of an SCR.
12. (a) Explain the construction, working, and applications of an LED.
OR
(b) Explain the working of a photo-diode and a photo-transistor.
13. (a) Explain the working of a full-wave rectifier with π -section filter.
OR
(b) Describe the operation of three-terminal IC voltage regulators (78XX and 79XX series).

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SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE (A), SULLURPET
FOUR YEAR B.Sc., HONOURS (CBCS) EXAMINATION, OCTOBER 2025
THIRD SEMESTER, PHYSICS MAJOR
COURSE 8: ANALOG AND DIGITAL ELECTRONICS

Time: 2 ½ Hours

Max. Marks: 60

SECTION – A

Answer any five of the following questions

5 × 4 = 20 Marks

1. Explain positive and negative feedback in amplifiers.
2. Differentiate the inverting and non-inverting operational amplifier configurations.
3. Explain the construction and working of a summing amplifier.
4. What is the significance of slew rate in op-amps?
5. Convert $(101101.101)_2$ into decimal equivalent.
6. Explain the realization of logic gates using NAND gate.
7. Write the truth table and logic diagram for a half-subtractor.
8. Explain the working of a JK flip-flop with diagram.

SECTION – B

Answer all the following questions

5 × 8 = 40 Marks

9. (a) Explain the block diagram and equivalent circuit of an operational amplifier.
OR
(b) Derive expressions for gain and bandwidth of a non-inverting op-amp.
10. (a) Explain the working of integrator and differentiator circuits using op-amps.
OR
(b) Explain input offset voltage, bias current, offset current, and CMRR in op-amps.
11. (a) Explain the different number systems.
OR
(b) State and prove De Morgan's theorems with logic gate implementation.
12. (a) Draw the truth table and circuit diagram of a full adder.
OR
(b) Explain the construction and applications of multiplexers and demultiplexers.
13. (a) Explain the working of D flip-flop and Master-Slave flip-flop.
OR
(b) Explain BCD to 7-segment decoder with diagram and applications.

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET

4TH YEAR B.Sc. HONORS WITH RESEARCH

PHYSICS, VII Semester, Paper 7.1

RESEARCH METHODOLOGY: CONCEPTUAL AND THEORETICAL PERSPECTIVES

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. Describe the nature and scope of Scientific research?
2. What is Scientific attitude and its characteristics?
3. Write short note on Variables?
4. Briefly discuss about antecedent variables?
5. Define Hypothesis and write its importance in Scientific research?
6. Explain the sources of hypothesis?
7. Distinguish between qualitative and quantitative research design?
8. Write a short note on in-depth interview?

SECTION – B

Answer any FIVE of the following (5 x 8 = 40 Marks)

9. (a) Explain Philosophical base of research?
or
(b) Explain different types of approaches of research?
10. (a) Explain independent, dependent and control variables?
or
(b) Explain extraneous and confounding variables?
11. (a) Explain Null and Alternate hypothesis?
or
(b) Describe steps of testing hypothesis?
12. (a) Explain exploratory and descriptive research design?
or
(b) Explain the different types of Experimental research design?
13. (a) Write in detail explanation of questionnaire data collection method?
or
(b) Write in detail explanation of focus group discussion data collection method?

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET
4TH YEAR B.Sc. HONORS WITH RESEARCH
PHYSICS, VII Semester, Paper 7.1

RESEARCH METHODOLOGY: CONCEPTUAL AND THEORETICAL PERSPECTIVES

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SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE (A), SULLURPET
FOUR YEAR B.Sc., HONOURS (CBCS) EXAMINATION, OCTOBER 2025
THIRD SEMESTER, PHYSICS MAJOR
COURSE 6: HEAT AND THERMODYNAMICS

Time: 2 ½ Hours

Max. Marks: 60

SECTION – A

Answer any five of the following questions

5 × 4 = 20 Marks

1. State and explain the law of equipartition of energy.
2. Define mean free path and explain factors affecting it.
3. Explain reversible and irreversible processes with examples.
4. Write a short note on entropy change in irreversible process.
5. Explain the physical significance of Helmholtz free energy.
6. Write about enthalpy in thermodynamics.
7. Explain the working principle of refrigeration.
8. What is Planck's law of black body radiation? State its significance.

SECTION – B

Answer all the following questions

5 × 8 = 40 Marks

9. (a) Derive Maxwell's distribution law of molecular velocities.
OR
(b) Derive an expression for the thermal conductivity of an ideal gas using kinetic theory.
10. (a) State Carnot's theorem and derive the efficiency of Carnot's heat engine.
OR
(b) Explain the Temperature–Entropy (T-S) diagram and discuss its applications.
11. (a) Derive Maxwell's thermodynamic relations from thermodynamic potentials.
OR
(b) Derive the Clausius–Clapeyron equation and explain its applications.
12. (a) Derive an expression for Joule–Thomson coefficient for an ideal gas.
OR
(b) Explain the principle of adiabatic demagnetization for producing low temperatures.
13. (a) Derive Planck's law of black body radiation and deduce Wien's displacement law from it.
OR
(b) Explain the method of determining solar constant using Angstrom's Pyrheliometer.

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4TH YEAR B.Sc. HONORS WITH RESEARCH

PHYSICS, VII Semester, Paper 7.3

STATISTICAL ANALYSIS FOR RESEARCH METHODOLOGY

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. What is SPSS. Explain its applications in Statistics?
2. Define range, variance and standard deviation?
3. Explain sampling distribution?
4. Explain point and interval estimations?
5. Write a short note on chi square test?
6. Explain briefly about ANOVA?
7. Write a short note on logistic regression analysis?
8. Write a short note on curve fitting method?

SECTION – B

Answer any FIVE of the following (5 x 8 = 40 Marks)

9. (a) Explain nominal, ordinal, discrete, continuous types of data?
or
(b) Explain measures of dispersion briefly?
10. (a) Explain one side and two side tests in statistical inference?
or
(b) Explain the null hypothesis, alternative hypothesis and level of significance?
11. (a) Explain student t-test and F-test?
or
(b) Explain Mann-Whitney and Wilcoxon test?
12. (a) Explain Pearson and Spearman correlation coefficients?
or
(b) Explain logistic regression analysis?
13. (a) Explain trend analysis using moving averages?
or
(b) Explain exponential smoothing methods?

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET
4TH YEAR B.Sc. HONORS WITH RESEARCH

PHYSICS, VII Semester, Paper 7.3

STATISTICAL ANALYSIS FOR RESEARCH METHODOLOGY

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. What is SPSS. Explain its applications in Statistics?
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SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET

4TH YEAR B.Sc. HONORS WITH RESEARCH

PHYSICS, VII Semester, Paper 7.4

ADVANCED ANALYTICAL TECHNIQUES FOR SCIENCE RESEARCH

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. Write a short note on X-ray photoelectron spectroscopy (XPS)?
2. Write a short note on X-ray Fluorescence spectroscopy (XPS)?
3. Explain small angle X-ray diffraction?
4. Write applications of Scanning Tunnelling Microscope?
5. Write a short note on electromagnetic spectrum?
6. Explain hot band and combination bands in Infrared spectroscopy?
7. Explain the Principle of NMR Spectroscopy?
8. Explain the Principle of thin layer chromatography?

SECTION – B

Answer any FIVE of the following (5 x 8 = 40 Marks)

9. (a) Explain the working of Energy Dispersive X-ray analysis (EDAX)?
or
(b) Explain Auger Electron Spectroscopy (AES)?
10. (a) Explain the construction and working of Scanning Electron Microscope (SEM)?
or
(b) Explain the construction and working of Transmission Electron Microscope (TEM)?
11. (a) Explain anharmonicity and Morse potential energy diagram in Infrared Spectroscopy?
or
(b) Explain Classical and Quantum theories of Raman Effect?
12. (a) Explain Shielding and de-shielding effects in proton NMR Spectroscopy?
or
(b) Explain the hyperfine splitting and factors affecting the g-value in Electron Spin Resonance (ESR)?
13. (a) Explain Gas liquid chromatography theory and instrumentation?
or
(b) Explain high performance liquid chromatography theory and instrumentation?

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET

4TH YEAR B.Sc. HONORS WITH RESEARCH

PHYSICS, VII Semester, Paper 7.2

RESEARCH METHODOLOGY: OBSERVATIONAL AND EMPIRICAL PERSPECTIVES

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. Write difference between Probability and Non-Probability sampling?
2. Explain Quota sampling?
3. Explain the rules of tabulation in data presentation?
4. Write the difference between Univariate and Bivariate?
5. Write about t-test?
6. Explain the sampling error?
7. Explain the secondary data?
8. Explain the principles of data interpretation?

SECTION – B

Answer any FIVE of the following (5 x 8 = 40 Marks)

9. (a) Define Sampling? Explain the characteristics of good sample?
or
(b) Explain the methods of Probability sampling?
10. (a) What are the methods for collecting primary data?
or
(b) Explain Editing and discuss the guidelines for editing?
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SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET
4TH YEAR B.Sc. HONORS WITH RESEARCH
PHYSICS, VII Semester, Paper 7.4

ADVANCED ANALYTICAL TECHNIQUES FOR SCIENCE RESEARCH

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. Write a short note on X-ray photoelectron spectroscopy (XPS)?
2. Write a short note on X-ray Fluorescence spectroscopy (XPS)?
3. Explain small angle X-ray diffraction?
4. Write applications of Scanning Tunnelling Microscope?
5. Write a short note on electromagnetic spectrum?
6. Explain hot band and combination bands in Infrared spectroscopy?
7. Explain the Principle of NMR Spectroscopy?
8. Explain the Principle of thin layer chromatography?

SECTION – B

Answer any FIVE of the following (5 x 8 = 40 Marks)

9. (a) Explain the working of Energy Dispersive X-ray analysis (EDAX)?
or
(b) Explain Auger Electron Spectroscopy (AES)?
10. (a) Explain the construction and working of Scanning Electron Microscope (SEM)?
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11. (a) Explain anharmonicity and Morse potential energy diagram in Infrared Spectroscopy?
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SVSSC GOVERNMENT DEGREE COLLEGE (A), SULLURPET

Semester – I JAN- 2026

MECHANICS AND PROPERTIES OF MATTER

Time: 2 ½ Hrs

Max Marks: 60 Marks

SECTION- I

Answer any Five of the following questions

5X4=20 M

1. Explain Newton's Laws of motion?
2. Write a brief note on NISAR.
3. Write the characteristics of Central Forces?
4. Explain Geo-stationery Satellites?
5. State and explain Hook's law?
6. Explain the types of Bending Beams?
7. Discuss the properties of Fluids?
8. Explain Time dilation?

SECTION- II

Answer ALL the questions

5x8=40 M

9. (a). Discuss the motion of a rocket under a constant gravitational field and derive the equation for velocity at any instant of time?
Or
(b). Derive an expression for the velocities of two particles after an elastic Collision in two dimensions.
10. (a). Derive an equation of motion under central force field?
Or
(b). State and prove Kepler's first law?
11. (a). Define three elastic module and obtain the relation between Y , η , K .
Or
(b). Describe the working principle of Torsional pendulum. What are its uses?
12. (a). State and explain Bernoulli's theorem?
Or
(b). Explain the principle and working of a Venturi meter?
13. (a). Explain Michelson – Morely experiment? Discuss the negative result?
Or
(b). Deduce Lorentz transformation Equations?

SVSSC GOVERNMENT DEGREE COLLEGE (A), SULLURPET

B.Sc. Physics (Honors)

Semester – I JAN- 2026

INTRODUCTION TO MATHEMATICAL PHYSICS

Time: 2 ½ Hrs

Max Marks: 60 Marks

SECTION- I

Answer any Five of the following Questions

5X4=20M

1. What are scalar and vector fields? Give Examples.
2. State and Explain line integral?
3. Explain the matrix operation of addition with example.
4. Discuss the steps to calculate the Eigen value with Example.
5. Define the argument and Modulus of a Complex number.
6. Write the Polar and Exponential Form of Complex number?
7. Explain the types of Random Variables?
8. Give the Limitations of Fourier theorem.

SECTION- II

Answer ALL the Questions

5x8=40 M

9. (a). Prove that the gradient of a scalar field is a vector and explain physical significance of Gradient.
Or
(b). State and prove Stokes theorem?
10. (a). What is matrix? Explain different types of Matrices.
Or
(b). Explain the matrix operations of Trace and Inverse with one Example?
11. (a). What is meant by conjugate of a complex number? Give some examples of complex conjugates.
Or
(b). Explain the operations on Complex numbers?
12. (a). State and explain Sample space and Events in Probability?
Or
(b). Explain Binomial Distribution and also give applications?
13. (a). State Fourier theorem to analyze a complex function. Derive the expression for Fourier coefficients?
Or
(b). Analyze Square wave with the help of Fourier theorem?

SRI V.S. SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE, SULLURPET
4TH YEAR B.Sc. HONORS WITH RESEARCH
PHYSICS, VII Semester, Paper 7.5
MATERIALS SCIENCE

Time: 2.30 Hrs.

Max. Marks: 60

SECTION – A

Answer any FIVE of the following (5 x 4 = 20 Marks)

1. Derive Gibbs-Thomson equation?
2. Explain Melt growth technique?
3. Write about the classification of Nanomaterials?
4. Write a short note on Quantum dots?
5. Write size dependent physical properties of semiconductor nanoparticles?
6. Write a short note on Quantum confinement?
7. Differentiate between Type-I and Type-II super conductors?
8. Write about the tools of green chemistry?

SECTION – B

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or
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