

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
(For the candidates admitted from the academic year 2023-2024 and thereafter)

M.Sc. DEGREE EXAMINATION - APRIL 2026
BRANCH III- PHYSICS
SECOND SEMESTER

COURSE : ELECTIVE
PAPER : GEOPHYSICS
SUBJECT CODE : 23PH/PE/GP15
TIME : 3 HOURS

MAX. MARKS: 100

| Q. No. | SECTION A | CO | KL |
|---------------|--|-----------|-----------|
| | ANSWER ALL THE QUESTIONS (10x3= 30 Marks) | | |
| 1 | Define the term Geochronology and state its importance in estimating the Earth's age. | 1 | 1 |
| 2 | What are Telluric currents, and how do they originate? | 1 | 1 |
| 3 | Identify the primary purpose of a Magnetic Gradiometer in geophysical surveys. | 1 | 1 |
| 4 | Briefly state the working principle of a Strain Seismometer. | 1 | 1 |
| 5 | Explain the physical difference between Compressional waves and Transverse waves. | 2 | 2 |
| 6 | Describe the concept of Seismic Tomography in studying the Earth's interior. | 2 | 2 |
| 7 | Illustrate the dispersion of Surface Waves and how it relates to Earth's structure. | 2 | 2 |
| 8 | Outline the origin of the Earth's Internal Magnetic Field according to magnetostatic models. | 2 | 2 |
| 9 | Calculate the electrical resistivity of a subsurface layer given a specific current and measured potential difference in a resistivity survey. | 3 | 3 |
| 10 | Apply the concept of Seismic Rays to show how reflections occur in a uniformly layered earth. | 3 | 3 |
| Q. No. | SECTION B | CO | KL |
| | Part A | | |
| | ANSWER ANY TWO QUESTIONS (2 x 5 = 10 Marks) | | |
| 11 | Using D'Alembert's principle, derive the solution for the seismic wave equation. | 3 | 3 |
| 12 | Demonstrate the method of location of the epicenter of an earthquake using seismic data from three stations. | 3 | 3 |
| 13 | Formulate a plan for a Self-Potential (SP) survey to investigate subsurface electrical properties. | 3 | 3 |

| Part B | | | |
|--|---|-----------|-----------|
| ANSWER ANY SIX QUESTIONS (6 x 5 = 30 Marks) | | | |
| 14 | Analyze the characteristics of Rayleigh (LR) and Love (LQ) waves and their propagation patterns. | 4 | 4 |
| 15 | Examine the secondary effects of earthquakes, such as tsunamis and landslides, and their environmental impact. | 4 | 4 |
| 16 | Compare the mechanisms of Horizontal-motion and Vertical-motion seismometers. | 4 | 4 |
| 17 | Analyze the radial variations of gravity and pressure as one moves from the crust to the core. | 4 | 4 |
| 18 | Investigate the Inversion of travel-time versus distance curves to model the Earth's interior. | 4 | 4 |
| 19 | Categorize the different types of Electromagnetic (EM) surveying techniques and their specific applications. | 4 | 4 |
| 20 | Evaluate the Geomagnetic Dynamo theory through the lens of computer simulations. | 4 | 4 |
| 21 | Explain the geological timescale and the scientific basis for determining the age of the solar system. | 4 | 4 |
| Q. No. | SECTION C ANSWER ANY TWO QUESTIONS (2 x 15 =30 Marks) | CO | KL |
| 22 | Investigate Earth's internal structure models, synthesizing data from seismic ray paths and density variations. | 5 | 5 |
| 23 | Explain Magnetic surveying in locating subsurface mineral deposits, providing real-time application scenarios. | 5 | 5 |
| 24 | Propose a multi-parameter approach for the prediction of earthquake time, location, and size by evaluating historical frequency and intensity data. | 5 | 5 |
| 25 | Assess the Electrical Properties of the Earth and justify how electrical conductivity measurements reveal the composition of the deep mantle. | 5 | 5 |
