

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted from the academic year 2015-16)

SUBJECT CODE : 15MT/PE/ME14

M. Sc. DEGREE EXAMINATION, APRIL 2016
BRANCH I – MATHEMATICS
SECOND SEMESTER

COURSE : ELECTIVE
PAPER : MECHANICS
TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A

Answer all the questions:

5×2=10

1. Write down conservation theorem for the Linear Momentum of a particle.
2. Define energy function h .
3. Explain orthogonality condition for a linear transformation.
4. Define free energy and write down the differential equation for its property.
5. Write the transformation of configuration space and phase space.

SECTION – B

Answer any five questions:

5×6=30

6. Give an example for non-holonomic constraint.
7. Discuss geodesics problem.
8. Explain general conservation theorem.
9. Obtain Euler's equations of motion for a rigid body with one point fixed.
10. Obtain Hamilton's canonical equations of motion.
11. Discuss the Routh's procedure of the particle moving in a plane under the influence of a central force derived from a potential function $V(r)$.
12. Obtain the new Hamiltonian function for the first two generating functions.

SECTION – C

Answer any three questions:

3×20=60

13. a) Obtain Lagrange's equation of motion for a holonomic system.
b) Obtain the equation of motion of the particle using plane polar coordinates. (10+10)
14. a) Discuss the brachistochrone problem.
b) Obtain Euler-Lagrange differential equations. (10+10)

15. a) Obtain the expression for the Kinetic energy of a rigid body with one point interms of the inertia coefficients.

b) State and prove parallel Axes theorem.

(10+10)

16. Obtain Jacobi's form of principle of least action.

17. Explain in detail the symplectic approach to canonical transformation.

