

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

SUBJECT CODE : 15MT/PE/ME14

M. Sc. DEGREE EXAMINATION, APRIL 2018
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. Define Degrees of freedom.
2. Write down Hamilton's principle for a Non-Holonomic system.
3. Define Coriolis Force.
4. What is Routh's Procedure?
5. Define Generating function.

SECTION – B

Answer any five questions:

5×6=30

6. Give any example for non-holonomic system.
7. State and prove Hamilton's principle.
8. Discuss the brachistochrone problem.
9. Discuss the rate of change of a vector.
10. Derive Hamilton's Canonical equations of motion.
11. Write short notes on any two canonical transformations.
12. Show that the transformation

$$Q = 1/2 (q^2 + p^2) \quad P = - \tan^{-1} q / p$$

is canonical.

SECTION – C

Answer any three questions:

3×20=60

13. a) Obtain the differential equation of motion for a double pendulum of length $2l$.

b) State and prove D'Alembert's principle.

14. Derive standard form of Lagrange's equation for a holonomic system.

15. Obtain Euler's equation of motion.

16. State and prove principle of least action.

17. Consider the transformation

$$Q = \log \frac{\sin p}{q}$$

$$P = q \cot p$$

obtain the first two generating functions.

