18. State and prove Brachistochrone problem.

19. Explain Pfaffian differential form and first Pfaffian's system.

20. Obtain the four types of generating function associated with the transformation $Q = \log \frac{\sin p}{q}$, $P = q \cot p$.

S.No. 169 **12 PMA 03**

(For the candidates admitted from 2012–2013 onwards)

M.Sc. DEGREE EXAMINATION,
NOVEMBER/DECEMBER 2015.

First Semester

Mathematics

MECHANICS

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Define nonholomic constraint.

2. Define workless constraint.

3. Define ignorable coordinates.

4. Define nature system.

5. State Geodesic problem.

6. Define stationary values of a function.

7. Write the Hamilton – Jacobi Equation.

8. State Jacobi's theorem.

9. Define Lagrange brackets.

10. Define point transformation.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) State and prove D'Alembert's principle.

Or

(b) Discuss principle of work and kinetic energy.

12. (a) State and prove Kepler problem.

Or

(b) Derive the standard form of Lagrange's equation for a holonomic system.

13. (a) Derive Hamilton equation of motion.

Or

(b) Find the stationary values of the function $f = z$ subject to the constrains

$\varphi_1 = x^2 + y^2 + z^2 - 4 = 0$

$\varphi_2 = xy - 1 = 0.$

14. (a) Derive the modified Hamilton-Jacobi equation.

Or

(b) Explain the Liouvelli's system.

15. (a) Consider the transformation $Q = \sqrt{e^{-2q} - p^2}$, $P = \cos^{-1}\left(P e^{q}\right)$. Use Poisson bracket to show that it is canonical.

Or

(b) State and prove Poisson theorem.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. State and prove Konig's theorem for N particles.

17. Find the differential equation of motion for a double pendulum.