Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University) Coimbatore – 43

Master's Degree Examination November 2018
III Semester

Class: II PG **Time: 3 hrs**
Major: Mathematics **Max. Marks: 60**

17MMAC17 Advanced Mechanics

PART – A **10 X ½ = 5**

Choose the correct answer

1. The number of degree of freedom if the coordinate is 3 and the independent equations of constraints are 3 is _____

   a.3 b. 4 c. 6 d. 2

2. If the virtual displacements $\Delta v < 0$. the equilibrium position is _____.

   a. Stable b. neutral c. unstable d. minimum potential.

3. The translational kinetic energy is _____

   a. singular b. non singular c. variable d. constant

4. The Routhian function R= _____

   a. $L - \beta q$ b. $L - \sum_{i=1}^{n} \beta_i q_i$ c. $L + \sum_{i=1}^{n} \beta_i q_i$ d. $L * \sum_{i=1}^{n} \beta_i q_i$

5. The Euler Lagrange equation is _____.

   a. $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial \dot{y}}\right)$ b. $\frac{\partial f}{\partial y} + \frac{d}{dx}\left(\frac{\partial f}{\partial \dot{y}}\right)$ c. $\frac{\partial f}{\partial y} * \frac{d}{dx}\left(\frac{\partial f}{\partial \dot{y}}\right)$ d. $\frac{\partial f}{\partial y} + \frac{d}{dx}\left(\frac{\partial f}{\partial \dot{f}}\right)$

6. The _____ conditions are sufficient for the separability of an orthogonal system.

   a. Hamilton b. Euler c. Liouville d. Lagrange

7. The first order partial differential equation is _____ equation

   a. Hamilton b. Euler c. Hamilton - Jacobi d. Lagrange

8. The Hamilton principle function is _____differential in all its argument.

   a. once b. twice c. maximum d. minimum

9. The function $\varphi(q, Q, t)$is _____function

   a. normal b. Separable c. partial d. generating

10. Poisson bracket is _____ under a canonical transformation.

    a. variant b. invariant c. equal d. identity

Section B

Answer ALL Questions. **(5x4=20 Marks)**

Answer should not exceed 200 words or one page

11. a. State and prove the principal of virtual work.

(Or)

b. State and prove that principle of work and kinetic energy.

12 a. Find the differential equation of motion for a spherical pendulum of length l.

(Or)

b. Write short notes on ignorable coordinates.

13. a. Find the stationary values of the function $f = z$ subject to the constraints $\phi_1 \equiv x^2 + y^2 + z^2 - 4 = 0;\ \phi_2 \equiv xy - 1 = 0$.

(Or)

b. Derive multiplier rule.

14. a. Derive the equation of first Pfaffian system.

(Or)

b. Derive modified Hamilton-Jacobi equation

15. a. Show that the transformation $Q = \frac{1}{2}(q^2 + p^2)$ *and* $P = -\tan^{-1}\frac{p}{q}$ is canonical.

(Or)

b. Express the bilinear covariant associated with Pfaffian differential form.

Section C

Answer ALL Questions. **(5x7=35 Marks)**

Answer should not exceed 600 words or 3 pages

16. a. A particle of mass m suspended by a massless wire of length r = a+b cos wt (a>b>0) to form a spherical pendulum. Find the equations of motion.

(Or)

b. State and prove Konig's theorem.

17. a. Derive the Lagrange's equation using Routhian function.

(Or)

b. Obtain the standard form of Lagrange's equation for a holonomic system.

18. a. Derive the Hamilton's canonical equations of motion.

(Or)

b. State and prove Hamilton's Principle.

19. a. Derive the Hamilton- Jacobi equation.

(Or)

b. State and prove Stackel's theorem.

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

(Or)

b. State and prove Poisson's theorem.