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**D.K.M.COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1**

**SEMESTER EXAMINATIONS**

**NOVEMBER - 2017**

**15CPMA1D**

**MECHANICS**

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**Time: 3 Hrs**

**Max.Marks : 75**

**SECTION-A (5x 6 =30)**

**Answer ALL the questions.**

1. (a) State and prove Konig's theorem.

(Or)

(b) Derive the expression for angular momentum of the system with respect to fixed point in terms of centre of mass.

2. (a) Derive the Lagrangian function with Routhian function.

(Or)

(b) Derive the energy integral for a conservative system.

3. (a) Find the stationary values of the function  $f=z$ , subject to the constraint  $\Phi_1=x^2+y^2+z^2-4=0$ ,  $\Phi_2=xy-1=0$ .

(Or)

(b) Derive Hamilton's canonical equation for standard non-holonomic system.

4. (a) State and prove Jacobi's theorem.

(Or)

(b) Discuss the mass spring system using Hamilton-Jacobi method.

5. (a) Prove that the transformation  $Q=\sqrt{2q} e^t \cos p$ ,  $P=\sqrt{2q} e^{-t} \sin p$  is canonical. Obtain the generating function.

(Or)

(b) Obtain the relation between Lagrange and Poisson brackets.

**SECTION-B (3x15 =45)**

**Answer any THREE of the following questions.**

6. A particle of mass  $m$  is suspended by a massless wire of length  $r = a + b \cos \omega t$  ( $a > b > 0$ ) to form a spherical pendulum. Find the equation of motion.

7. Derive the standard form of Lagrange's equation for a Holonomic system.

8. State and prove the Principle of least action.

9. Solve Kepler's problem using Stäckel's theory on separability.

10. Show that the transformation  $Q=\log\left(\frac{\sin p}{q}\right)$  and  $P = q \cot p$  is canonical and also obtain the four major types of generating function associated with this transformation.

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