# C.U. SHAH UNIVERSITY Winter Examination-2018

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**Subject Name: Classical Mechanics** 

Subject Code: 5	SC01CLM1	Branch: M.Sc. (Physics)	
Semester: 1	Date: 28/11/2018	Time: 02:30 To 05:30	Marks: 70

### **Instructions:**

- (1) Use of Programmable calculator and any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

## SECTION – I

Q-1 Attempt the Following questions

(07)

a.	Define	Generalized	Coordinates
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- **b.** Relate two functions using Legendre's Dual Transformation.
- **c.** State the main difference between Newtonian and Lagrangian for system of particles.
- **d.** Write the general expression for Euler-Lagrange equation of motion
- e. Give the mathematical expression for conservation of angular momentum.
- **f.** What do you mean by ignorable coordinates?
- g. List the types of constraints in a Simple Pendulum motion with variable length.

Q-2		Attempt all questions	(14)
C	a.	Using Lagrange's Equation, solve the Simple Harmonic Motion problem.	06
	b.	Explain briefly conservation of angular momentum	04
	c.	What do you mean by Principle of virtual work?	04
		OR	
Q-2		Attempt all questions	(14)
-	a.	Give an account on Routhian function.	07
	b.	Quote some points to show the significances or advantages of Hamiltonian over	07
		Lagrangian.	
Q-3		Attempt all questions	(14)
	a.	Derive the Euler-Lagrange's equation of motion.	07
	b.	Obtain the Lagrangian for a simple Atwood's machine.	07

### OR

Q-3	<b>a.</b> Explain in detail constraints and its types with suitable examples.		08
	b.	Deduce the expression for D'Alembert's Principle.	06



## **SECTION – II**

Q-4		Attempt the Following questions	(07)
	a.	Why Hamilton Principle is also known as 'Variational Principle'?	
	b.	Express Poisson Bracket for two dynamic variables <b>u</b> and <b>v</b> .	
	c.	Define Stable Equilibrium.	
	d.	Write an identity followed by Poisson brackets.	
	e.	State two significances of Hamilton over Lagrangian	
	f.	Give some examples where small oscillation theory is applicable. What are Generating Functions?	
	g.	what are Generating Functions?	
Q-5		Attempt all questions	(14)
	a.	Deduce the characteristic equation for the case of two coupled oscillators.	08
	b.	Give (at least 5) identities followed by Poisson Bracket for dynamic variables.	06
		OR	
Q-5	a.	Using the explanation of Canonical Transformation, obtain the Hamilton's canonical equations.	07
	b.	Explain the working of Generating functions in obtaining new Hamiltonian for a system.	07
Q-6		Attempt all questions	(14)
	a.	Enumerate on Poisson Bracket.	07
	b.	Gauge transformation is invariant for expressions in electrostatics. Justify.	07
		OR	
Q-6		Attempt all Questions	
	a.	Explain the Hamilton-Jacobi theory	07
	b.	Comment on Kepler's Problem using Lagrangian formulation.	07

