DG-3116

B. Sc. (Sem. V) Examination

March / April - 2016

Physics : Paper - VI

(Mechanics & Mathematical Methods)

Time : 2 Hours] [Total Marks : **50**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :	☛ **B. Sc. (Sem. 5)**
Name of the Subject :	☛ **PHYSICS : PAPER - 6**
☛ Subject Code No. :	**3 1 1 6**
☛ Section No. (1, 2,.....) :	**Nil**

Seat No. :

Student's Signature

(2) Figures to the right indicate total marks carried by the question.

(3) All symbols used have their usual meaning.

(4) Students are allowed to use a non-programmable scientific calculator.

Q1 Answer in brief : **[8]**

(1) What do you mean by constrained motion?

(2) What are forced oscillations?

(3) Write any one limitation of Newton's laws.

(4) What is the unit of angular momentum?

(5) Define orthogonal curvilinear co-ordinates.

(6) State Stoke's curl theorem.

(7) If $\phi=2x^2y^3z^4$, Find the gradient of ϕ in Cartesian co-ordinate system.

(8) Define line integral of a vector field.

Q2 (A) Answer anyone in detail : [10]

(1) Derive Lagrange's equation of motion for non-conservative system from D'Alembert's principle.

(2) Write down an expression for kinetic energy in terms of generalized velocity for a system of particles. Obtain expressions for generalized momenta.

(B) Answer anyone : [4]

(1) Consider a system of N particles with masses $m_1, m_2, \dots, m_N$ located at Cartesian co-ordinates $\vec{r}_1$, $\vec{r}_2, \dots, \vec{r}_N$ acted upon by forces derivable from a potential function $V(\vec{r}_1, \vec{r}_2, \dots, \vec{r}_N)$. Show that Lagrange's equations of motion reduce directly to Newton's second law.

(2) Express angular momentum of the system as the sum of angular momentum of motion of the centre of mass and angular momentum of the motion about the centre of mass.

Q3 (A) Answer anyone in detail : [10]

(1) State and prove Gauss' divergence theorem.

(2) Express gradient, divergence and curl in terms of circular cylindrical co-ordinates.

(B) Answer anyone : [4]

(1) If $\phi = 2x^3y^2z^4$ then find div(gradϕ).

(2) Compute A = $\int (xdy - ydx)$ over the parabola $y = x^2$ from (0,0) to (3,9).

Q4 Answer any two : [14]

(1) Explain the conservation of mechanical energy of the system of particles.

(2) Discuss generalized co-ordinates and notation for generalized co-ordinates with proper examples.

(3) State and prove Green's theorem in plane.

(4) Obtain curl of vector field in terms of curvilinear co-ordinates.
