* A B - 3 1 1 6 *

AB-3116

B. Sc. (Sem. V) Examination

March/April – 2015

Physics : Paper - VI

(Mechanics & Mathematical Methods)

Time : 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 scientific calculator.

1 Answer in brief : **8**

(1) What are forced, damped harmonic oscillations ?

(2) What is an isolated system ?

(3) Define generalised Co-ordinates.

(4) Give meaning of "the number of degree of freedom".

(5) Define curvilinear Co-ordinates.

(6) If $\phi = 4x^2y^2z^3$ then grad ϕ = ______.

(7) When the vector is said to be a solenoidal vector ?

(8) Define line integral of a vector field.

2 (a) Answer any **one** : **10**

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

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

(b) Attempt any **one** : **4**

(1) Show that the kinetic energy can be expressed as the sum of kinetic energy of motion of centre of mass and the kinetic energy of motion about the centre.

(2) Show that the angular momentum is conserved in motion under a central force.

3 (a) Answer any **one** : **10**

(1) Obtain the expressions for Gradient, Divergence, Curl and Laplacian in spherical polar Co-ordinates.

(2) State and prove Gauss's divergence theorem.

(b) Attempt any **one** : **4**

(1) Prove the $\vec{V} = 3y^4z^2\,\hat{i} + 4x^3z^2\,\hat{j} - 3x^2y^2\,\hat{k}$ is a solenoidal vector.

(2) Compute $I = \int (xdy - ydx)$ over the (i) Straight line $y = x$ from (0, 0) to (1, 1) (ii) Parabola $y = x^2$ from (0, 0) to (1, 1).

4 Answer any **two** of the following : **14**

(1) Obtain the expression for generalised displacement, generalised velocity and generalised acceleration.

(2) Derive Hamilton's principle from D'Alembert's principle.

(3) Explain surface and volume integration.

(4) State and prove stoke's theorem.