PBJ-003-1271001 Seat No. _____

M. Sc. (ECI) (Sem. I) (CBCS) Examination

November / December - 2018

Foundation of Science & Mathematics : Paper - I

(New Syllabus)

Faculty Code : 003

Subject Code : 1271001

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Figures on right hand side indicate marks.
(2) Assume suitable data if necessary.

1 Answer the following : (any **seven**) **14**

(1) Define and explain distance and displacement with suitable example.

(2) What are the properties of vector addition ?

(3) Determine following :

(i) $\tan 15°$

(ii) $\sin 75°$

(4) What is oscillatory motion ? Write conditions for such motion and give examples of it.

(5) $\int \left(x^4 - 12x^2 + 7\right) dx$

(6) What is unit vector and fixed vector ?

(7) List out only CGS and SI unit of distance, speed and acceleration.

(8) Determine : $\begin{bmatrix} 5 & 7 \\ 8 & 9 \end{bmatrix}$

(9) What is motion ? Explain in brief.

(10) What is angular motion ? What are its types ?

2 Answer the following : (any **two**) **14**

(1) (i) If $x + y = xy^3$, then find $\frac{dy}{dx}$

(ii) If $y = \sin\left(\cos x^3\right)$, then find $\frac{dy}{dx}$

(2) Derive the motion equation $v = u + at$ from the velocity-time graph.

(3) Mention and explain in detail various methods of vector addition.

3 Answer the following :

(1) Write about the Newton's first law of motion and hence explain inertia and force in detail. **7**

(2) Explain Centripetal and Centrifugal forces with necessary diagrams. Also derive expressions for centripetal acceleration. **7**

OR

3 Answer the following :

(1) A space ship travelling in space at 300 km/sec, fires its engine for 15 sec, such that its final velocity is 600 km/sec. Calculate the total distance travelled by the ship in one minute starting from the time of firing. **7**

(2) Find the maximum and minimum value of the function $y = x^3 - 3x^2 + 6$. **7**

4 Answer the following :

(1) Solve : **7**

(i) $\int \sin^2 x \cdot \cos^3 x \cdot dx$

(ii) $\int \sin^5 x \cdot dx$

(2) State and briefly explain Newton's third law of motion with example. **7**

5 Answer the following : (any **two**)

(1) What is simple harmonic motion ? Derive expressions for velocity and acceleration in SHM. Also derive expressions for frequency and time period of mass spring oscillator. **7**

(2) Given here, $y = 4x^3 - 2x^2 + 2x + 7$. If $\frac{d^2y}{dx^2} a + x = 2$, then find 'a'. **7**

(3) Draw the graph of $y = \sin x$ and $y = \tan x$. **7**

(4) What are polar (or radial) and axial (or pseudo) vector ? Compare both this types of vectors. **7**