2020

MATHEMATICS - HONOURS

Paper: CC-10

Internal Assessment

Full Marks:10

The figures in the margin indicate full marks .
Candidates are required to give their answers in their own words as far as practicable.

Choose the correct alternative. *5×2*

1.Linear momentum of a particle of mass m and velocity v is given by
a)mv^2 b)2mv c)m$^2v^2$ d)mv

2. 1 newton is equal to
a)10^5dyne b)10dyne c)10^{-3}dyne d)100dyne

3.The time period of a planet is given by
a)$\frac{2\pi}{\sqrt{\mu}}a^{3/2}$ b) $\frac{2\pi}{\sqrt{\mu}}a$ c)2μa d) πa^3

4."A bullet shot from a gun"- the force acting here is
a) Gravitational force b) Impulsive force

c)Centripetal force d) Centrifugal force

5. When two elastic bodies collide if the direction of motion of one or both of them before impact is not along the line of impact then this is called

a) direct impact b)line of impact c)oblique impact d)None

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Paper: CC-10
THEORY EXAMINATION
Full Marks: 32

The figures in the margin indicate full marks .
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Answer any four

1. A particle describes the curve $r^n = a^n \cos n\theta$ under a central force to a pole. Find the law of force. **8**

2. A particle of mass *m* moves in a straight line under an attractive force $m\mu x$ towards a fixed point on the line when at a distance *x* from it. If it be projected with a velocity *V* towards the centre of force from an initial distance a from it, then prove that it reaches the centre of force after a time $\frac{1}{\sqrt{\mu}} \tan^{-1} \frac{a\sqrt{\mu}}{V}$. **8**

3. A particle performing a S.H.M. of period *T* about a centre O passes through a point P with a velocity *v* in the direction $\overrightarrow{OP}$. If OP be equal to *x* and the particle returns to P in time *t* then show that $t = \frac{T}{\pi} \tan^{-1} \frac{vT}{2\pi x}$. **8**

4. A gun of mass *M* fires a shell of mass *m* horizontally and the energy of explosion is such as would be sufficient to project the shell vertically to a height *h.* Show that the velocity of the recoil of the gun is $\left\{ \frac{2m^2gh}{M(m+M)} \right\}^{\frac{1}{2}}$. **8**

5. An engine draws a train along a level line starting from rest. If the pull of the engine be constant till the steam is shut off and the resistant *F* be constant throughout the journey, then prove that greatest rate of working is $\frac{2lF^2t}{Ft^2 - 2Ml}$, where *M* is the mass of the train, *l* the length of the journey and *t* the time occupied by it. **8**