OR

lekUrj fo|r rFkk pEcdh; {k=k e ,d vkof'kr d.k dh xfr dh foopuk dhft ,A

Discuss the motion of a change particle in parallel electric and magnetic fields.

ç'u 5- v';ku rjy d iokg d fy, ;yj lehdj.k dh LFkkiuk dhft ,A

Deduce Euler's equation for flow of non-viscous fluid.

OR

d.Vhyhoj D;k g\ d.Vhyhoj d Lor= flj ij fLFkj flj l njh ij voueu d fy, l= 0;RiUu dhft ,A

What is cantilever? Derive an expression for the depression at a distance x from the fixed and of a cantilever.

---x---

Roll No..... Total No. of Sections : 03

Total No. of Printed Pages : 06

Code No. : S-153

Annual Examination - 2018

B.Sc. - I

PHYSICS

Paper - I

MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER

Max.Marks : 50

Time : 3 Hrs. Min.Marks : 17

Vhi ; **[k.M ^v* esa nl vfry?kqZkjh iz'u gSa] ftUgsa gy djuk vfuok;Z gSA [k.M ^c* esa y?kqZkjh ç'u ,oa [k.M ^l* esa nh?kZ mÙkjh ç'u gSA [k.M ^v* dk lHkh igys gy djsaA**

Note : Section 'A', containing 10 very short-answer-type questions, is compulsory. Section 'B' consists of short-answer-type questions and Section 'C' consists of long-answer-type questions. Section 'A' has to be solved first.

Section - 'A'

fuEukfdr vfry?kqZkjh ç'uksa d mÙkj ,d ;k nks okD;ksa esa nsaA

Answer the following very short-answer-type questions in one or two sentences. **(1x10=10)**

ç'u 1- vtMRoh; fun'kZ Ýse fdls dgrs gSa\

What is non-inertial frame of reference?

ç'u 2- fdlh Bksl xksys d dsUnz rFkk i"B ij x:Roh; foHkoksa dk vuqikr D;k gksrk gS\

What is the ratio of gravitational potentials at the centre and at the surface of a solid sphere.

ç'u 3- tV bUtu dh dk;&fof/k fdl Hkkfrd jkf'k d lj{k.k fu;e ij vk/kkfjr gS\

On conservation of which physical quantity does the working of a jet engine depend?

P.T.O.

ç'u 4- M n0;eku vkj R f=T;k d ,d Bkl cyu dk] mldh T;kferh; v{k d lekUrj vkj mldh lrg ij fLFkr v{k d ifjr% tMRo vk/k.k dk 0;qRØe ¼eku½ fyf[k,A

Write the expression (Value) of moment of inertia of a solid cylinder of mass M, radius R, about an axis parallel to the geometrical axis and passing through a line on its surface.

ç'u 5- ljy vkor xfr fdl Hkkfrd jkf'k d lj{k.k ij vk/kkfjr gA

On conservation of which physical qnantity the simple harmonic motion is based?

ç'u 6- ,d ljy ykyd dk nkyu djr le; fdl fLFkfr e bld /kkx e ruko vf/kdre gkrk g\

In what position of an oscillating simple pendulum, the tension in its thread is maximum?

ç'u 7- fdlh voefnr nkfyr= dk voenu fu;rkd 0-02 ld.M^{-1} gA bldk JkfUrdky D;k gkxk\

The damping coustant of a damped harmonic oscillator in 0.02 S^{-1} What is its relaxation time?

ç'u 8- fo'k"krk x.kkd dh foek D;k g\

What the dimensions of quality factor.

ç'u 9- jf[kd Rofjr d dk;dkjh foHko dk eku fyf[k,A

State the working potential of a linear accelerator.

ç'u 10- ikj dh NkVh&NkVh cn feydj ,d cMh cn cukrh g] D;k\

Why are the droplcts of mercury when brought in contact, pulled together to form a bigger drop?

Section - 'B'

fuEukfdr y?k mÙkjh; ç'uk d mÙkj 150&200 'kCn lhek e n

Answer the following short-answer-type questions with word limit 150-200 **(3x5=15)**

ç'u 1- fl) djk fd dUnh; cy lj{kh gkrk gA

Show that a central force in conservative.

OR

gkrk gA

Write Kaplr's laws of planetary motion. Prove that the square of time period of revolution of a planet is proportional to the cube of the semi-major anis of ellipse.

ç'u 2- ljy vkork nkfy= dh lEi.k ;kf=d Åtk dk 0;qRØe Kkr dhft, rFkk bld egRoi.k fu"d"kk dk le>kb,A

Obtain an enpression for total mechanical energy of a simple harmonic oscillator and its important conclusions.

OR

M n0;eku rFkk R f=T;k d Bkl xksy dk

¼1½ 0;kl d ifjr rFkk

¼2½ Li'k j[kk d vufn'k

v{k d ifjr% tMRo vk/k.k dh x.kuk dhft,A

Obtain an expression for the moment of inertia of a solid sphere of mass M and radius R about its diametrical axis and about its tangent.

ç'u 3- voefnr vkork nkfyr dh vody lehdj.k fyf[k, vkj bl vf/kvoefnr] vfr voefnr rFkk ØkfUrd voefnr n'kk e gy dhft,A

Write the differential equation for damped harmonic oscillator and find its solution in over damped critically damped and under damped conditions.

OR

fyLlkt vkdfr;k D;k g\ fuEufyf[kr ifjfLFkfr d fy, vko';d fp= dh lgk;rk l xkih; fof/k }kjk fyLlkt vkdfr ikIr dju dh fof/k dk le>kb,A vkofRr vuikr =1:2 rFkk dyUrj $\frac{\pi}{2}$

What are lissajous figures? Explain the method for obtaining Lissajous figures by graphical method for the following case with the help of necessary diagram:

freqnency ratio =1:2 and phese difference = $\frac{\pi}{2}$

ç'u 4- PkEcdh; yUl ij ,d lf{kIr fVIi.kh fyf[k;A

Write a short note on magnetic lens.

P.T.O.

,d iry ,d leku xkyh; [kky d dkj.k] bld ckgj fdlh fcUn ij x:Roh; foHko dk 0; td fuxfer dhft ,A

Obtain expression for gravitational potential due to a spherical shell at a point outside the shell.

ç'u 2- Z v{k d lki{k ,d lefer n< fi.M d tMRo vk/k.kh ,d tMRo x.kuQyk d fy, 0; td ikIr dhft ,A

Deduce an expression for moment of inertia and products of inertia of a rigid body rotating about Z-axis.

OR

2 fdxk n0;eku rFkk 5 leh- f=T;k d ,d Bkl xky dk rkj l yVdkdj xky dk ,Bu nkyu djk; tkr gA ;fn fuyEcu rkj dh ,Bu n<rk $4x10^{-3}$ U;Vu ehVj ifr ,dkd jfM;u ,Bu dk.k g rk nkyuk dk vkordky Kkr djkA

A solid sphere of mass 2 kg and radius 5 cm is suspended by a wire and is made to execute torsional orcillations. If the torsional rigidity of suspension wire in $4x10^{-3}$ Nm per unit radian twist, calculate the time period of oscillations.

ç'u 3- fyLlkt vkdfr ij fVli.kh fyf[k,A

Write a short note on lissajous figure.

OR

,d nkfy= dk vk;ke 2000 nkyu i'pkr mld ikjfEHkd eku dk $\frac{1}{10}$ok jg tkrk gA ;fn vkofRr 200 gVt gk rk x.kuk dhft, %&

The amplitude of an oscillator falls to $\frac{1}{10}^{th}$ of its initial value after 2000 oscillations. If the freqnency in 200 HZ, calculate :-

½1½ fo'k"krk x.kkd

Quality factor

½2½ voenu fu;rkd

Damping constant

ç'u 4- ,d lkbDykVku e 1-5 Vlyk dk pEcdh; {k= vkjkfir fd;k tkrk gA ikVku dk Rofjr djku d fy, vko';d jfM;k vkofRr nkfy= dh vkofRr dh x.kuk djkA ;fn lkbDykVku dh iR;d dh f=T;k 50 leh

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,d iry ,d leku xkyh; [kky d dkj.k] bld ckgj fdlh fcUn ij x:Roh; foHko dk 0; td fuxfer dhft ,A

Obtain expression for gravitational potential due to a spherical shell at a point outside the shell.

ç'u 2- Z v{k d lki{k ,d lefer n< fi.M d tMRo vk/k.kh ,d tMRo x.kuQyk d fy, 0; td ikIr dhft ,A

Deduce an expression for moment of inertia and products of inertia of a rigid body rotating about Z-axis.

OR

2 fdxk n0;eku rFkk 5 leh- f=T;k d ,d Bkl xky dk rkj l yVdkdj xky dk ,Bu nkyu djk; tkr gA ;fn fuyEcu rkj dh ,Bu n<rk $4x10^{-3}$ U;Vu ehVj ifr ,dkd jfM;u ,Bu dk.k g rk nkyuk dk vkordky Kkr djkA

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ç'u 4- ,d lkbDykVku e 1-5 Vlyk dk pEcdh; {k= vkjkfir fd;k tkrk gA ikVku dk Rofjr djku d fy, vko';d jfM;k vkofRr nkfy= dh vkofRr dh x.kuk djkA ;fn lkbDykVku dh iR;d dh f=T;k 50 leh

g rk ikVku }kjk ikIr Åtk Kkr djk fdxkA (m_p=1.67X10^{-27} fdxk)

In a cyclotron, magnetic field strength 1.5 tesla is applied. calculate the freqnency of the radio freqnency oscillator required to accelerate proton If radius of each dee of the cyclotron is 50 cm, calculate the energy gained by the proton (m_p=1.67X10^{-27} kg)

OR

byDVku xu D;k g\ bldh dk; fof/k le>kb,A

What is an electron gun? Explain its working.

ç'u 5- n'kkb, fd leku inkFk] leku n0;eku rFkk leku yEckbZ d [kk[ky cyu dh ,Bu n<rk Bkl cyu dh vi{kk vf/kd gkrh gA

Show that the torsional rigidity of a hollow cylinder in greater than that of a solid cylinder of same mass, length and material.

OR

lokbZ tyh dk l= fyf[k,A lokbZ tyh d l= ykx gku d fy, D;k&D;k vko';d 'kr g\ lokbZ tyh dk l= xlk e D;k ykx ugh gkrk g\

Write poireuille's formula. State the conditions for the poireuille's formula to hold. why is Poiseuille's equation not valid in gases?

Section - 'C'

fuEukfdr nh?k mÙkjh; ç'uk d mÙkj 300&350 'kCn lhek e n

Answer the following long-answer-type questions with word limit 300-350 **(5x5=25)**

ç'u 1- fl) djk fd /k.kk Ýe e m n0;eku d fdlh d fdlh d.k ij yxu okyk dkfjvkfyl cy $-2m\vec{w}\times\vec{v_r}$ gkrk g] tgk w /k.kk Ýe dk ,dleku dk.k; ox g rFkk $\vec{v_r}$ d.k dk /k.kh Ýe e ox gA

Prove that the coriolis force acting on a particle of mass m in a rotatory frame is $-2m\vec{w}\times\vec{v_r}$ where w is the uniform angular velocity of the rotatory frame and $\vec{v_r}$ is the velocity of particle in the rotatory frame.

OR

dlkyj d xg lEcU/kh xfr d fu;e fyf[k,A fl) dhft, fd xg d ifjØe dky dk ox nh?koRr dh v)nh?k v{k d /ku d vuØekuikrh

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g rk ikVku }kjk ikIr Åtk Kkr djk fdxkA (m_p=1.67X10^{-27} fdxk)

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Show that the torsional rigidity of a hollow cylinder in greater than that of a solid cylinder of same mass, length and material.

OR

lokbZ tyh dk l= fyf[k,A lokbZ tyh d l= ykx gku d fy, D;k&D;k vko';d 'kr g\ lokbZ tyh dk l= xlk e D;k ykx ugh gkrk g\

Write poireuille's formula. State the conditions for the poireuille's formula to hold. why is Poiseuille's equation not valid in gases?

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ç'u 1- fl) djk fd /k.kk Ýe e m n0;eku d fdlh d fdlh d.k ij yxu okyk dkfjvkfyl cy $-2m\vec{w}\times\vec{v_r}$ gkrk g] tgk w /k.kk Ýe dk ,dleku dk.k; ox g rFkk $\vec{v_r}$ d.k dk /k.kh Ýe e ox gA

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OR

dlkyj d xg lEcU/kh xfr d fu;e fyf[k,A fl) dhft, fd xg d ifjØe dky dk ox nh?koRr dh v)nh?k v{k d /ku d vuØekuikrh