**Annual Online Examination 2020**

**(Only for Regular Students)**

**Centre Code– 135 Centre Name- Disha College, Raipur (C.G.)**

**Subject - Physics Class-B.Sc.-I**

**Paper - I Time - 3 Hours**

**Paper Name – Mechanics, Oscillations and Properties of Matter M.M. - 50**

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**Note: Attempt all questions. uksV%& lHkh ç’uksa ds mRrj nhft,A**

**UNIT - 1**

**(a)** What do you meant by the central force??

dsUnzh; cy ds varZxr xfr ls vki D;k le>rs gSa\ (4)

**(b)** For a particle moving under a central force show that:

(i) angular momentum of the particle remains constant, (ii) particle moves in a rigid plane, (iii) areal velocity of the particle remains constant.

fl) dhft, fd dsUnzh; cy varZxr xfr djrs gq, d.k dk (i) dksf.k; laosx fu;r jgrk gSA

(ii) xfr ,d gh ry esa gksrh gS\ (iii) d.k dh {ks=h; pky fu;r gksrh gS\ (6)

**OR** vFkok

**(a)** Prove that the centre of mass of two point particle lies on the line joining them and the ratio of distances of centre of mass from the particles is equal to the inverse ratio of their masses?

fl) dhft, nks d.kksa ds fy, nzO;eku dsUnz ls d.kksa dh nwfj;ksa dk vuqikr muds nzO;ekuksa ds O;qRØe ds vuqikr ds cjkcj gksrk gSA (8)

**(b)** Define centre of mass.

nzO;eku dsUnz dks le>kb,A (2)

**UNIT – 2**

(a) Explain products of inertia. What do you understand by potential well and explain periodic oscillations in it. (4)

tM+Ro ds xq.kuQy dks le>kb;sA foHko dwi dk vFkZ le>krs gq, mlesa vkorhZ nksyuksa dh O;k[;k dhft,A

(b) Show that the motion of a mass attached at the free end of a massless spring suspended by a rigid support is simple harmonic. Establish the expression for the time period of its oscillations.

fl) dhft, fd ,d n`<+ vk/kkj ls yVdh nzO;eku jfgr fLçax ds eqDr fljs ls c¡/ks nzO;eku dh xfr ljy vkorZ xfr gksrh gSA blds nksyuksa ds vkorZdky dh O;atd LFkkfir dhft,A (6)

**OR** vFkok

(a) What do you meant by moment of inertia of a body?.

fdlh fi.M ds tM+Ro vk?kw.kZ ls D;k rkRi;Z gS\ ¼4½

(b) Deduce an expression for the kinetic energy of a rotating body. Deduce an expression representing the Euler’s equations for the motion of a rigid body.

?kw.kZu xfr dj jgs fi.M dh xfrt ÅtkZ dk O;atd fuxfer dhft,A n`<+ fi.M ds fy;s ;wyj ds xfr dk lehdj.k O;qRiUu dhft,A (6)

**UNIT - 3**

(a) Explain power absorption by a forced harmonic oscillator and half power points and also find the expression? (5)

ç.kksfnr vkorhZ nksfy= ds fy;s ‘kfDr vo’ks”k.k ,oa v)Z’kfDr fcUnqvksa dks ifjHkkf”kr dhft, rFkk O;atd O;qRiUu dhft;sA

(b) Prove that band width per unit mass is equal to damping constant. (5)

fl) dhft;s fd cS.M pkSM+kbZ çfr bdkbZ nzO;eku ds Åoeanu fu;rkad ds cjkcj gksrh gSA

**OR** vFkok

1. What is Lissajous figure? (3)

fyLlktw vkd`fRr;k¡ D;k gSa\

1. Explain Lissajous figures when two mutually perpendicular simple harmonic oscillations of

the frequency ration 1:1 and phase difference varying between 0 and , superpose. (7)

ljy vkorZ xfr;k¡ ftudh vko`fRr;ksa dk vuqikr 1%1 gS rFkk dykUrj 0 ls ds chp cnyrk gS] ,d dks.k ij v/;kjksfir djrh gS] dk ifj.kkeh foLFkkiu Kkr dhft,A

**UNIT - 4**

(a) Describe the principle and construction of cyclotron.

lkbDyksVªku ds fl)kar ,oa lajpuk dks le>kb;sA (5)

(b) Deduce an expression for the energy acquired by the particle. Write its limitations?

blds }kjk vkosf’kr d.k dh çkIr ÅtkZ gsrq O;atu O;qRiUu dhft,A bldh lhek,¡ D;k gSa\ (5)

**OR** vFkok

1. An electron of energy 10ev is revolving in a circular path in a magnetic field 1x10-4 weber/m2. Calculate : (i) speed of electron, (ii) radius of circular path and (iii) frequency of the electron (me = 9.0x10-31kg). 10ev ÅtkZ dk ,d bysDVªku 1x10-4 oscj/ ehVj2 ds pqEcdh; {ks= esa o`Rrkdkj ekxZ esa pDdj yxk jgk gSA

Kkr dhft,& ¼1½ bysDVªku dh pky ¼2½ bysDVªku dh vko`fRr ¼3½ o`Rrkdkj ekxZ dh f=T;k (5)

1. A beam of electrons moves in magnetic field of intensity 2.0x 10-3 weber/m2 directed along y-axis, normal to it. The velocity of electron is 3.0x107m/s along x-axis. What magnitude of electric field be simultaneously applied to keep the electron beam undeflected. (5)

2.0x10-3 oscj/ ehVj2 rhozrk ds y fn’kk esa fn”V pqEcdh; {ks= esa mlds yEcor bysDVªkuksa dk ,d iq¡t xfr djrk gSA bysDVªkuksa dk osx 3.0x107m/s x fn’kk esa gSA pqEcdh; {ks= ds gh lkFk fdruh rhozrk dk fo|qr {ks= fdl fn’kk esa yxk;k tk;s fd bysDVªkWu iq¡t vius ekxZ ls vfopfyr jgsA

**UNIT – 5**

1. What is Poisson’s ration? Show that the theoretical value of Poison’s ratio lies between -1

and 0.5(i.e. -1<<0.5).

ikbtu vuqikr ls vki D;k lr>rs gS\ fl) dhft, fd ikbtu vuqikr dk lS)kafrd eku -1 vkSj 0.5 ds chp gksrk gS (i.e. -1<<0.5) (5)

1. Prove that Y = 2(1+σ) 0r σ= Y/2η – 1.

fl) dhft, Y = 2(1+σ) 0r σ= Y/2η – 1. (5)

**OR** vFkok

1. State stoke’s law for a body moving in a viscous medium. Show that the terminal speed of a ball falling in a viscous liquid is proportional to the square of its radius. (5)

fdlh ‘;ku rjy esa xfreku fi.M ds fy;s LVksd dk fu;e fyf[k, rFkk fl) dhft;s fd fdlh ‘;ku rjy esa fxjrh xksyh dh lhekUr ;k vUR; pky mldh f=T;k ds oxZ ds lekuqikrh gksrh gSA

(b) What do you meant by the torsion in a cylinder? Obtain an expression for the torque required to twist a uniform solid cylinder and hollow cylinder.

fdlh csyu dh ,saBu n`<+rk ls D;k le>rs gSa\ ,d le#i Bksl csyu rFkk [kks[kys csyu dks ,saBu ds fy;s vko’;d cy vk?kw.kZ ds fy;s O;atd fuxfer dhft;sA (5)

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