First B.E. EXAMINATION - 2019

(Second Semester)

MA - 153 A : MATHEMATICS - II

(Common for All Sections)

Time - Three Hours

Maximum Marks - 100

Note:- (1) Attempt **FIVE** questions, selecting at least one from each section.

SECTION - A

1. Solve the differential equations -

   (a) $(y^3+2)y\,dx+(xy^3+2y^4-4x)\,dy=0$ 6

   (b) $y=2px+yp^2$ 6

   (c) $(D^2+6D+9)y=x^{-3}e^{-3x}$ 8

2. Solve the differential equations -

   (a) $x^2\dfrac{d^2y}{dx^2}+3x\dfrac{dy}{dx}+y=(1-x)^{-2}$ 10

(Contd.)

(b) $(2x+1)\frac{d^2y}{dx^2}-(4x+4)\frac{dy}{dx}+4y=0$ 10

3. (a) Solve the differential equation -

$$\frac{d^2y}{dx^2}-(\cot x)\frac{dy}{dx}-\left(\sin^2 x\right)y=\cos x\sin^2 x$$ 10

(b) Solve the differential equation, using method of variation of parameters

$$\left(\frac{d^2y}{dx^2}-x+1\right)(x-1)=x\frac{dy}{dx}-y$$ 10

SECTION - B

4. (a) ACB is a uniform rod of weight W, it is supported with its end A against a smooth vertical wall AD by means of a string CD, BD being horizontal and CD inclined to the wall at 30°. Find the tension in the string and reaction of the wall. 10

(b) A uniform ladder of weight W, inclined to the horizontal at 45°, rest with lower end at rough horizontal ground and upper end on a rough wall. If coefficients of friction of ground and wall are μ_1 and μ_2 respectively, then find a minimum horizontal force which will move the lower end towards wall. 10

5. (a) A heavy uniform string hangs over two smooth pegs in same horizontal line. It the length of each portion hangs freely be n times the length between the pegs. Find the ratio of whole length of string to the span of catenary formed. 10

(b) Derive the formulae for the radial and transversal velocities and accelerations. 10

6. (a) A partical moving in a parabola with uniform angular velocity about the focus find its normal acceleration. 10

(b) A body moving in a straight line OAB with simple harmonic motion, it has zero velocity when at the points A and B whose distance from O are a and b respectively. It has velocity V at half way between them. Find time of one oscillation. 10

SECTION - C

7. (a) Find the equation of the sphere having the following circle as great circle

$$x^2+y^2+z^2=16;\ 2x-3y+6z=7$$ 10

(b) Find the locus of the vertex of cone whose guiding curve is standard ellipse in xy plane, and curve of intersection of cone and plane x = 0 is rectangular hyperbola. 10

8. (a) Find the equation of right circular cone whose vertex is origin, axis is x = y = z and a generator is 2x = 3y = -5z. 10

(b) Find the equation of cylinder whose axis is $\frac{x}{l}=\frac{y}{m}=\frac{z}{n}$ and the guiding curve is $x^2+y^2+2gx+2fy+c=0$; $z=0$ 10

$x^2+y^2+z^2=1$ and $x+y+z=1$. 10

8\. (a) If $2x = y = 2z$ is one of the three mutually perpendicular generators of a cone $11yz+6xz-14xy=0$, find the equation of other two generators. 10

(b) Find the equation of cylinder whose axis $\frac{x}{4}=y-2=\frac{z}{3}$ and guiding curve is

$$4x^2+2y^2=1;\ Z=0$$ 10

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Roll No. ....

I[st] B.E.

3

Math -II

First B.E. EXAMINATION - 2018

(Second Semester)

MA - 153 A : MATHEMATICS - II

(Common for All Sections)

Time - Three Hours

Maximum Marks - 100

Note:- 1. Attempt **FIVE** questions, selecting at least one from each section.

Section A

1\. Solve the differential equations

(a) $(xy^3+y)\,dx+2(x^2y^2+y^4+y)\,dy=0$ 6

(b) $P+\sqrt{1+P^2}=\frac{y}{x}$ 6

(c) $(D^2+1)^2(D^2+D+1)y=e^x$ 8

2\. Solve the differential equations

(a) $x^2\frac{d^2y}{dx^2}+7x\frac{dy}{dx}+13y=\log x$ 10

(b) $\frac{d^2y}{dx^2} - \cot x \frac{dy}{dx} - (1 - \cot x)y = e^x \sin x$ 10

3. (a) Solve the differential equation

$$x\frac{d^2y}{dx^2} - \frac{dy}{dx} - 4x^2y = 4x^3 \sin x^2$$ 10

(b) Solve by the method of variation of parameters

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^x/(e^x + 1)$$ 10

SECTION B

4. (a) A uniform rod of length a hangs against a smooth vertical wall being supported by means of a string of length l, tied to one end of the rod, other end of string being attached to a point in the wall, show that angle between rod and the wall is given by

$$\cos\theta = \sqrt{\frac{l^2 - a^2}{3a^2}}$$ 10

(b) A heave uniform string hangs over two smooth pegs in the same horizontal line. If the length of each portion which hangs freely be n times the length between pegs. Prove that whole length of string and distance between pegs are in ratio

$$\sqrt{\frac{2n+1}{2n-1}} \Big/ \log\sqrt{\frac{2n+1}{2n-1}}$$ 10

5. (a) Four equal rods, each of weight w and length a are jointed to form a rhombus ABCD angle B and D are jointed by a string of length l, the system is placed in a vertical plane with A resting on a horizontal plane, AC being vertical. Find the tension in the string. 10

(b) A small bead slides with constant speed v on a smooth wire in the shape of the cardioid r = a (1+cos θ). Show that angular velocity is $\frac{v}{2a\cos\theta/2}$ and radial acceleration is constant. 10

6. (a) A particle rests in equilibrium under the attraction of two centres of forces which attract directly as the distance, their intensities being μ and μ'. The particle is slightly displaced towards one of them, show that time of small oscillation is $\frac{2\pi}{\sqrt{\mu + \mu'}}$ 10

(b) A particle is projected with velocity V along a smooth horizontal plane in a medium whose resistance per unit mass is proportional to cube of velocity find the distance it describe in time t and also find velocity then. 10

SECTION C

7. (a) A sphere of radius a passes through origin and meet the axes in A, B, C show that the locus of centroid of the tetrahydron OABC is

$$x^2 + y^2 + z^2 = (a/2)^2$$ 10

(b) Find the equation of cone whose vertex is (1,1,1) and which passes through the intersection of

Section-C

7- (a) Prove that the centre of sphere which touches the line $y = mx, z = c$ and the line $y = -mx; z = -c$, lies on the surface $mxy + cz(1+m^2) = 0$. (10)

(b) If $2x = y = 2z$ represents one of the three mutually perpenticular generators of the cone $11yz + 6xz - 14xy = 0$. Find the equation of other two. (10)

8- (a) Find the locus of common vertex of two cones with guiding curves $z^2 = 4ax; y = 0$ and $z^2 = 4by; x = 0$. The plane $z = 0$ meet them in two conics which interset in four concyclic points. (12)

(b) Find the equation of a right circular cylinder whose radius is 4 and axis is $x = 2y = -z$. Also find area of section of cylinder by the plane $z = 0$. (8)

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Roll No. 17BEE10616

1st B.E. Math-II

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First B.E. Examination, 2017

(Second Semester)

MA-153 A: MATHEMATICS- II

(Common for all Sections)

Time - Three Hours

Maximum Marks - 100

Note:- (1) Attempt **FIVE** questions, selecting at least one from each section.

Section-A

1- Solve the differential equations.

(a) $(12y+4y^3+6x^2)dx+12x(1+y^2)dy=0$ (6)

(b) $\left[1+\left(\frac{dy}{dx}\right)^2\right]\left[x-\tan^{-1}\left(\frac{dy}{dx}\right)\right]=\frac{dy}{dx}$ (6)

(c) $(3x+2)^2\frac{d^2y}{dx^2}+(9x+6)\frac{dy}{dx}-36y=3x^2+4x+1$ (8)

2- Solve the second order differential equation.

(a) $x\frac{d^2y}{dx^2}-(2x+2)\frac{dy}{dx}+(x+2)y=(x-2)e^{2x}$ (10)

(b) $\frac{d^2y}{dx^2}-4x\frac{dy}{dx}+(4x^2-1)y=-3e^{x^2}.Sinx$ (10)

3- Solve the differential equation.

(a) $\frac{d^2y}{dx^2}-cotx\frac{dy}{dx}-Sin^2x.y=\cos x-\cos^3 x$ (8)

Solve the differential equation, using method of variation of parameters.

(b) $x^2\frac{d^2y}{dx^2}-(2x+2x^2)\frac{dy}{dx}+(2+2x)y=x^4$ (12)

Section-B

4- (a) One end of uniform rod of weight W is attached to a hinge and other end is supported by a string. Rod and the string is inclined at the same angle α with horizontal. Find direction and magnitude of reaction at hinge. (10)

(b) A uniform thin hemispherical bowl rest with its curved Surface on a rough horizontal plane and Leans against smooth vetical wall. Find the inclination of the axis of bowl with vertical, when the bowl is on the point of slip. (μ is coefficient of friction). (10)

5- (a) Find the Length of an endless chain which will hang over a circular pully of radius r so as to be in contact with two third of the circumference of pully. (10)

(b) A particle is moving along a curve $r=f(\theta)$ Find its radial and transverse acceterations. (10)

6- (a) A particle at P is moving along the curve $r=ae^{\theta Cot\alpha}$ with constant angular velocity about the pole find its acceleration and inclination of the direction of acceleration with tangent at P. (10)

(b) A particle is performing simple harmonic motion about a centre O, it passes through a point P at a distance b from O with velocity V in the direction OP. After how much time particle return to P? (Time period of SHM is T) (10)

(3)

Section-C

7- (a) Prove that the centre of sphere which touches the line $y = mx, z = c$ and the line $y = -mx; z = -c$, lies on the surface $mxy + cz(1+m^2) = 0$. (10)

(b) If $2x = y = 2z$ represents one of the three mutually perpenticular generators of the cone $11yz + 6xz - 14xy = 0$. Find the equation of other two. (10)

8- (a) Find the locus of common vertex of two cones with guiding curves $z^2 = 4ax; y = 0$ and $z^2 = 4by; x = 0$. The plane $z = 0$ meet them in two conics which interset in four concyclic points. (12)

(b) Find the equation of a right circular cylinder whose radius is 4 and axis is $x = 2y = -z$. Also find area of section of cylinder by the plane $z = 0$. (8)

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Roll No. 17BEE10616

1st B.E.
3

Math-II

First B.E. Examination, 2017

(Second Semester)

MA-153 A: MATHEMATICS- II
(Common for all Sections)

Time - Three Hours
Maximum Marks - 100

Note:- (1) Attempt **FIVE** questions, selecting at least one from each section.

8 4 8

Section-A

1- Solve the differential equations.

(a) $\left(12y+4y^3+6x^2\right)dx+12x\left(1+y^2\right)dy=0$ (6)

(b) $\left[1+\left(\frac{dy}{dx}\right)^2\right]\left[x-\tan^{-1}\left(\frac{dy}{dx}\right)\right]=\frac{dy}{dx}$ (6)

(c) $(3x+2)^2\frac{d^2y}{dx^2}+(9x+6)\frac{dy}{dx}-36y=3x^2+4x+1$ (8)

2- Solve the second order differential equation.

(a) $x\frac{d^2y}{dx^2}-(2x+2)\frac{dy}{dx}+(x+2)y=(x-2)e^{2x}$ (10)

(b) $\frac{d^2y}{dx^2}-4x\frac{dy}{dx}+\left(4x^2-1\right)y=-3e^{x^2}.Sinx$ (10)

3- Solve the differential equation.

(a) $\frac{d^2y}{dx^2}-cotx\frac{dy}{dx}-Sin^2x.y=\cos x-\cos^3 x$ (8)

Solve the differential equation, using method of variation of parameters.

(b) $x^2\frac{d^2y}{dx^2}-\left(2x+2x^2\right)\frac{dy}{dx}+(2+2x)y=x^4$ (12)

Section-B

4- (a) One end of uniform rod of weight W is attached to a hinge and other end is supported by a string. Rod and the string is inclined at the same angle α with horizontal. Find direction and magnitude of reaction at hinge. (10)

(b) A uniform thin hemispherical bowl rest with its curved Surface on a rough horizontal plane and Leans against smooth vetical wall. Find the inclination of the axis of bowl with vertical, when the bowl is on the point of slip. (μ is coefficient of friction). (10)

5- (a) Find the Length of an endless chain which will hang over a circular pully of radius r so as to be in contact with two third of the circumference of pully. (10)

(b) A particle is moving along a curve $r=f(\theta)$ Find its radial and transverse acceterations. (10)

6- (a) A particle at P is moving along the curve $r=ae^{\theta Cot\alpha}$ with constant angular velocity about the pole find its acceleration and inclination of the direction of acceleration with tangent at P. (10)

(b) A particle is performing simple harmonic motion about a centre O, it passes through a point P at a distance b from O with velocity V in the direction OP. After how much time particle return to P? (Time period of SHM is T) (10)

8

(b) Find the equation of right circular cylinder whose axis is $\frac{x-2}{2}=\frac{y-1}{1}=\frac{z}{3}$ and which passes through $(0,0,1)$. 10

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Roll No. 15BEA10071

1st B.E.

3 **Maths-II**

First B.E. Examination, 2016

(Second Semester)

MA - 153 A : MATHEMATICS - II

(Common for all Sections)

Time - Three Hours

Maximum Marks : 100

Note :- Attempt **FIVE** questions, selecting at least one from each section.

Section - A

1. (a) Solve: 6

$$\left(y^3-2x^2y\right)dx+\left(2xy^2-x^3\right)dy=0$$

(b) Solve: 7

$$\frac{dy}{dx}-\frac{dx}{dy}=\frac{x}{y}-\frac{y}{x}$$

(c) Solve: 7

$$\left(D^2+3D+2\right)^2 y=e^x$$

2. (a) Solve: 10

$$\frac{d^2y}{dx^2}+y=\operatorname{cosec} x$$

(b) Solve:

$$x^2\frac{d^2y}{dx^2}-2x(1+x)\frac{dy}{dx}+2(1+x)y=x^3$$ 10

3. (a) Solve: 10

$$\frac{d^2y}{dx^2}+\frac{2}{x}\frac{dy}{dx}+y=\frac{\sin 2x}{x}$$

(b) Solve: 10

$$(1-x)\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=(1-x)^2$$

Section - B

4. (a) A uniform rod of Length a hangs against a Smooth vertical wall being supported by means of a string of length tied to one end of the rod, other end of the string is attached to a point in the wall. Show that inclination θ of rod with wall is given by: 10

$$\theta=\cos^{-1}\left[\sqrt{\frac{l^2-a^2}{3a^2}}\right]$$

(b) A thin uniform triangular plate of equal sides rests with one end of its base on a rough (μ coefficient of friction) horizontal plane and other end against smooth wall. Find least angle between the base and horizontal. 10

5. (a) A uniform chain, of length 2a and weight 2w, is suspended from two points in the same horizontal Level. A weight w is now suspended from middle point of chain. Depth of this point below horizontal is h. Find tension in the chain. 10

(b) A heavy uniform rod of length 2a, rests with its ends in contact with two smooth inclined planes of inclination α and β with horizon angle between the rod and

(b)

horizon being θ. Use principle of virtual work, Prove that. 10

$$\theta=\tan^{-1}\left[\frac{\cot\alpha-\cot\beta}{2}\right]$$

6. (a) A small bead slids with constant speed v on a smooth wire in the form of cardioid $r=a(1+\cos\theta)$. Show that its angular velocity is $\frac{V}{2a}\sec\theta/2$ and its radial acceleration is constant. 10

(b) A body is moving in a straight line OAB with SHM, at the point A and B its velocity being zero, distances of A and B from O are a and b respectively. V is velocity at mid-point between A and B. Find the time of oscilation. 10

Section - C

7. (a) Two spheres of radii r_1 and r_2 cuts orthogonally. Find radius of their common circle. 10

(b) The section of a cone whose vertex is P and guiding curve is ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1; z=0$ by the plane $x=0$ is rectangular hyperbola. Find the locus of P. 10

8. (a) Show that the lines drawn through the origin at right angles to the normal planes of the cone $ax^2+by^2+cz^2=o$, generates the cone. 10

$$\frac{a(b-c)^2}{x^2}+\frac{b(c-a)^2}{y^2}+\frac{c(a-b)^2}{z^2}=0$$

(7) ABCD

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Roll No. ...10279...

1st B.E.

3

Maths—II

First B.E. Examination, 2015

(Second Semester)

MA-153 A : MATHEMATICS—II

(Common for all Sections)

Time—Three Hours

Maximum Marks—100

Note :— Attempt **FIVE** questions, selecting at least **one** from each section.

SECTION—A

1. (i) Solve :

$$(xy \sin xy + \cos xy)\, y\, dx + (xy \sin xy - \cos xy)\, x\, dy = 0.$$ 6

(ii) Solve :

$$x^2p^2 - 2xyp + 2y^2 - x^2 = 0.$$ 7

(iii) Use the substitutions $y = u$ and $xy = v$ to solve :

$$x^2p^2 + yp\,(2x + y) + y^2 = 0.$$ 7

2. (i) Solve :

$$(D^2 - 4D + 4)y = 8x^2e^{2x} \sin 2x.$$ 10

$(c_1+c_2x)e^{2x}$

(ii) Solve :

$$x^2\frac{d^2y}{dx^2}+4x\frac{dy}{dx}+2y=e^x.$$ 10

3. (i) Solve :

$$\frac{d^2y}{dx^2}-2\tan x\frac{dy}{dx}+5y=e^x \sec x.$$ 10

(ii) Solve by the variation of parameters :

$$D^2y + 4y = 4 \tan 2x.$$ 10

SECTION—B

4. (i) A uniform wire AOB is bent at O into two straight portions inclined at an angle θ, OA and OB being of length a and b respectively. If OB is horizontal when the wire is suspended from A ; prove that :

$$\cos\theta=\frac{b^2}{a(a+2b)}.$$ 10

$\frac{\sin\theta}{\cos\theta} \times \cos\theta$

$\cos\theta$ $\sin\theta = \frac{\frac{b}{a}}{\frac{a+2b}{b}}$

$\frac{\sin\theta}{\tan\theta}$

(8)

(ii) A weight of 30 kgs rests on a horizontal rough plane whose coefficient of friction is $\frac{1}{\sqrt{3}}$. Prove that the least force which will move it, is equal to the weight of 15 kgs and acts at an angle 30° to the horizon. 10

5. (i) The end links of a uniform chain slide along a fixed rough horizontal rod. If the angle of friction be λ, prove that the ratio of the maximum span to the length of the chain is :

$$\log\cot\frac{\lambda}{2} : \cot\lambda.$$ 10

(ii) Five weightless rods of equal lengths are jointed together so as to form a rhombus ABCD with one diagonal BD. If a weight W be attached to C and the system be suspended from A, show that there is a thrust in BD equal to $W/\sqrt{3}$. Use the principle of virtual work. 10

6. (i) A particle describes a curve (for which s and ψ vanish simultaneously) with uniform velocity v.

9

If the acceleration at any point is $\frac{v^2c}{s^2+c^2}$, find the intrinsic equation of the curve. 10

(ii) A particle is moving with S.H.M. from an extremity of path towards the centre is observed to be at distances x_1, x_2, x_3 from the centre at the end of three successive seconds. Show that the time of complete oscillation is $\frac{2\pi}{\theta}$ where :

$$\cos\theta = \frac{x_1 + x_3}{2x_2}.$$ 10

SECTION—C

7. (i) Find the locus of the centre of a variable sphere which passes through the origin and meets the axes in A, B, C so that the volume of tetrahedron OABC is constant. 10

4xyz=c

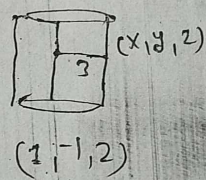
(ii) Find the equation of the sphere described on the line joining the points (2, –1, 4) and (–2, 2, –2) as diameter. Also find the area of the circle in which this sphere is cut by the plane 2x + y – z = 3. 10

$\frac{317\pi}{24}$

8. (i) Find the enveloping cone of the sphere :

$x^2 + y^2 + z^2 + 2x - 2y = 2$ with the vertex at (1, 1, 1). 10

(ii) Find the equation of the right circular cylinder whose radius is 3 and whose axis passes through the point (1, –1, 2). The direction ratios of the axis are 2, –1, 3. 10



~~V = dx/dt~~

$q = \frac{dV}{dt}$

is alwyas constant and its angular velocity is $\frac{v}{2a}\sec(\theta/2)$ 5.

(b) A particle is describing a circle of radius a in such a way that the tangential acceleration is always k times the normal acceleration. If its speed at a certain point is u, prove that it will return to the same point after a time $\frac{a}{ku}(1-e^{-2\pi k})$ 10 (10+10)

8.(a) A particle of mass m is performing SHM in the line jointing two points A and B on a smooth plane and is connected with these points by elastic strings of natural lengths a and a', the modulli of elasticity being λ and λ' respectively, show that the periodic time is

$$2\pi\sqrt{\left\{m\left(\frac{\lambda}{a}+\frac{\lambda'}{a'}\right)^{-1}\right\}}$$

(b) If a particle is ascending vertically in a medium in which the resistence is kv^2 per unit mass. Show that its distance at any instant below the highest point of its path is $\frac{1}{k}\log\left\{\sec t'\sqrt{(gk)}\right\}$ 5

where t' denotes the time it will take to reach its highest point. (10+10)

10

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Roll No. 42.00136.

1st B.E.
3

Maths-II

First B.E. Examination, 2014
(Second Semester)
MA-153 A : MATHEMATICS - II

(Common for all sections)

Time : Three Hours
Maximum Marks : 100

Note : (1) Attempt any FIVE questions.
(2) Marks allotted to each part of the question are indicated on the right side.

SECTION - A

1. Solve the following differential equations: 15

(i) $(1+e^{x/y})\,dx+e^{x/y}\left\{1-\frac{x}{y}\right\}dy=0$ (5)

(ii) $(3xy-2ay^2)\,dx+(x^2-2ayx)\,dy=0$ (5)

(iii) $y=2px+p^2y$ (5)

(iv) $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+3x\frac{dy}{dx}-3y=x^2+x$ (5)

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2. Solve the following differential equations:

(i) $x^2\frac{d^2y}{dx^2}-2x(1+x)\frac{dy}{dx}+2(1+x)y=x^3$ 4

(ii) $\frac{d^2y}{dx^2}+\frac{2}{x}\frac{dy}{dx}+\frac{a^2}{x^4}y=0$

(iii) Using method of variation of parameters,

solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=x^2e^x$ (6+7+7)

3.(a) A variable plane is parallel to the plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=0$ and meets the axex at A,B,C repectively. Prove that the circle ABC lies on the surface. 10

$$yz\left(\frac{b}{c}+\frac{c}{b}\right)+zx\left(\frac{a}{c}+\frac{c}{a}\right)+xy\left(\frac{a}{b}+\frac{b}{a}\right)=0$$

(b) Find the equation of the sphere which touches the plane $3x+2y-z+2=0$ at the point $(1,-2,1)$ and cuts the sphere $x^2+y^2+z^2-4x+6y+4=0$, orthogonally. 8 (10+10)

4.(a) Prove that the equation $\sqrt{(fx)}+\sqrt{(gy)}+\sqrt{(hz)}=0$ represents a cone which touches the coordinate planes. Find the equation of its reciprocal cone.

(b) Find the equation of right circular cylinder described on the circle through the three points (1,0,0), (0,1,0) and (0,0,1) as guiding circle. (10+10)

SECTION - B

5.(a) The altitude of a cone is h and the radius of its base is r; a string is fastened to the vertex and to a point on the circumference of the circular base, and is then put over a smooth peg, show that if the cone rest with its axis horizontal, the length of the string must be $\sqrt{(h^2+4r^2)}$

(b) How high can a particle rest inside a hollow sphere of radius a if the coefficient of friction be $1/\sqrt{3}$? (10+10)

6.(a) A rope of length 2ℓ is suspended between two points at the same level and the lowest point of the rope is b below the points of suspension. Show that the horizontal component of tension is $\frac{W}{2b}(\ell^2-b^2)$, W being the weight of the rope per unit length.

(b) Two equal uniform rods AB and AC, each of length 2b are freely jointed at A and rest on a smooth vertical circle of radius a. Show that if 2θ be the angle between them, then b $\sin^3\theta$ = a $\cos\theta$. (10+10)

7.(a) A small bead slides with constant speed v on a smooth wire in the shape of a cardiod r = a(1+cos θ). Show that its radial acceleration