ANNUAL EXAMINATION 2020

(Only for Regular Students)

Centre No. 135	***Centre Name- Disha College, Raipur (C.G.)***
Class-B.Sc.-I	**Subject- Mathematics**
Paper No-III	**Paper Name- Vector Analysis & Geometry**
Time- 3 hrs.	**M.M.-50**

Note – *Attempt all units. Solve any two from each units. Each question carries equal marks.*

Unit-I

Q1. **;fn** $r^2 = x^2 + y^2 + z^2$ **rc** r^n **dk eku Kkr dhft,A**

If $r^2 = x^2 + y^2 + z^2$ then find grad r^n

Q2. **;fn** $\vec{V} = e^{xyz}(-\hat{\imath} + \hat{\jmath} + \hat{k})$ **rk** $\vec{V}$ **Kkr dhft,A**

If $\vec{V} = e^{xyz}(-\hat{\imath} + \hat{\jmath} + \hat{k})$ find curl $\vec{V}$

Q3. **;fn** $\vec{a} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$, $\vec{b} = 2\hat{\imath} - \hat{\jmath} + \hat{k}$ **rFkk** $\vec{c} = 3\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ **rk lR;kfir dhft,**

fd $\vec{a}x(\vec{b}x\vec{c}) = (\vec{a}.\vec{c})\vec{b} - (\vec{a}.\vec{b})\vec{c}$

If $\vec{a} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$, $\vec{b} = 2\hat{\imath} - \hat{\jmath} + \hat{k}$ and $\vec{c} = 3\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ then verify

that $\vec{a}x(\vec{b}x\vec{c}) = (\vec{a}.\vec{c})\vec{b} - (\vec{a}.\vec{b})\vec{c}$

Unit-II

Q1. **lery e xhu çe; dk lR;kiu** $I = \oint c[(x + 2y)dx + (y + 3x)dy]$ **d fy, dhft, tgk** C **oRr** $x^2+y^2 = 1$ **gA**

Use green's theorem in plane to evaluate $I = \oint c[(x + 2y)dx + (y + 3x)dy]$ where C is the circle $x^2+y^2 = 1$.

Q2. **eku Kkr dhth,** $\int_c \vec{F}.\overrightarrow{dr}$, $\vec{F} = (x^2 + y^2)i - 2xyj$ **od** C, xy **ry e ,d vk;r g tk** y=0, x=a, y=b, x=0 **l f?kjk gA**

Evaluate $\int_c \vec{F}.\overrightarrow{dr}$ where $\vec{F} = (x^2 + y^2)i - 2xyj$ and

C is the rectangle in the xy plone bounded by y=0, x=a, y=b, x=0.

Q3. **xkml MkbotUl dk lR;kiu dhft,]** $\iint_s [(x^3 - yz)\hat{\imath} - 2x^2y\hat{\jmath} + 2\hat{k}].\hat{n}ds$ **tgk** S **funs'kkd leryk o lery** x = y = z = a **l ifjc) ?ku dk i"B gA**

Verify gauss divergenc theorem over the surface of cube bounded by co-ordinate planes and the planes x = y = z = a, $\iint_s [(x^3 - yz)\hat{\imath} - 2x^2y\hat{\jmath} + 2\hat{k}].\hat{n}ds$

Unit-III

Q1. Trace the parabola. $9x^2 + 24xy + 16y^2 - 2x + 14y + 1 = 0$ and find the coordinates of its focus and the equation to its directrix.

ijoy;% $9x^2+24xy+16y^2-2x+14y+1=0$ **dk vuj[k.k dhft, rFkk blds ukfHk d funs'kkd vkj fu;rk dk lehdj.k çkIr dhft,A**

Q2. **n'kkb;s fd js[kk** $\frac{l}{r} = A cos\theta + B sin\theta$ **'kkdo** $\frac{l}{r} = 1 + e cos\theta$ **dks Li'kZ djrh dh fy, çfrcU/k** $(A-e)^2 + B^2 = 1$ **gSA**

Show that the condition that the line $\frac{l}{r} = A cos\theta + B sin\theta$ may touch the conic $\frac{l}{r} = 1 + e cos\theta$ is $(A-e)^2 + B^2 = 1$

Q3. **fl) dhft, fd nh?kZoRr** $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ **ds fcUnq ls [khaps x, vfoijoy; dk lehdj.k ftldk mRdsUnz dks.k** $'\propto'$ **gS vkSj tks nh?kZoRr ls lukfHk** $\frac{x^2}{cos^2\propto} - \frac{y^2}{sin^2\propto} = a^2 - b^2$ **gSA**

Prove that the equation to the hyperbola drawn though point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ whose eccentric angle is $'\propto'$ and which is confocal with the ellipse is $\frac{x^2}{cos^2\propto} - \frac{y^2}{sin^2\propto} = a^2 - b^2$

Unit-IV

Q1. **ljy js[kkvksa** $\frac{x-3}{+3} = \frac{y-8}{-1} = \frac{z-3}{1}$ **rFkk** $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ **ds chp dh U;wure njh dh eki rFkk U;wure njh dh ljy js[kk dk lehdj.k Kkr dhft,A**

Find length and equation to the shortest distance between the lines $\frac{x-3}{+3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$

Q2. **ml 'kadq dk lehdj.k Kkr dhft, ftldk 'kh"kZ** (α, β, γ) **vkSj vk/kkj oØ** $ax^2 + by^2 = 1, z = 0$ **gSA**

Find the equation of the cone whose vertex is (α, β, γ) and base curve $ax^2 + by^2 = 1, z = 0$

Q3. **ml csyu dk lehdj.k Kkr dhft, ftlds tud** $x = \frac{y}{-2} = \frac{z}{3}$ **ds lekarj gS rFkk vk/kkj oØ** $x^2 + 2y^2 = 1, z = 3$ **gSA**

Find the equation of the cylinder whose generators are parallel to the line $x = \frac{y}{-2} = \frac{z}{3}$ and whose guiding curve is the ellipse $x^2 + 2y^2 = 1, z = 3$

Unit-V

Q1. Find the equation to the generators of the hyperboloid $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$ Which pass through the point $(a\cos\propto, b\sin\propto, 0)$

vfrijoy;t $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$ **ds fcUnq** $(a\cos\propto, b\sin\propto, 0)$ **ls tkus okys tudks ds lehdj.k Kkr dhft,A**

Q2. **'kkdot** $ax^2 + by^2 + cz^2 = 1$ **ds fcUnq** $((\alpha, \beta, \gamma)$ **ij Li'kZ ry dk lehdj.k Kkr dhft,A**

Find equation of tangent plane at $((\alpha, \beta, \gamma)$ to the conicoid $ax^2 + by^2 + cz^2 = 1$

Q3. **fl) dhft, fd fdlh fLFkj fcUnq ls ,d ijoy;t ij ikap vfHkyEc [khaps tk ldrs gSA**

Prove that five normals can be drawn from a fixed point to the paraboloid.

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