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### **DEPARTMENT OF MATHEMATICS**

UNIT - IV FUNCTIONS OF SEVERAL VARIABLES

METHOD OF LAGRANGIAN'S MULTIPLIERS

We can find an extreme value of the function f(x,y,3) subject to the constrained y(x,y,3)=0

Define Flx, y, z) = f(x, y, z) + 2 g(x, y, z) where 2 is an undetermined constant called the Lagrangian multipliers.

By solving the eqn.

DF = 0, DF = 0, DF = 0, DF = 0, we yet the Values & x, y, z and & Jusing & value find x, y, z find the values of the maximum or minimum by substituting x, y, z in J(x, y, z). D Find the minimum value & x<sup>2</sup>+y<sup>2</sup>+z<sup>2</sup>, given that an + by + Cz = P

Let  $J = n^2 + y^2 + 3^2$  and  $g = an + by + c_3 - p$  F(n, y, 3) = J(n, y, 3) + Jg(n, y, 3) $= n^2 + y^2 + 3^2 + J [an + by + c_3 - p]$ 

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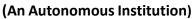
**UNIT - IV FUNCTIONS OF SEVERAL VARIABLES** 

$$\begin{array}{l} \partial F &= 2\pi + \alpha \beta \\ \Rightarrow \partial F &= 0 \Rightarrow 2\pi + \alpha \beta = 0 \\ \Rightarrow 2$$

=) 
$$\alpha = -\frac{3}{2} + b = -\frac{3}{2} + c = P$$
  
=)  $-\frac{3}{2} \int a^2 + b^2 + c^2 \int = P$   
=)  $\beta = -\frac{2}{2} \frac{P}{a^2 + b^2 + c^2}$ 

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 $\therefore n = -\frac{2}{2} \Rightarrow n = \frac{pa}{a^2 + b^2 + c^2}$  $y = -\frac{\lambda b}{2} \implies y = \frac{pb}{a^2 + b^2 + c^2}$  $3 = -\frac{\lambda c}{2} \Rightarrow 3 = \frac{pc}{\alpha^2 + b^2 + c^2}$  $3 = 9x^2 + y^2 + 3^2$  $= \left(\frac{pa}{a^{2}+b^{2}+c^{2}}\right)^{2} + \left(\frac{pb}{a^{2}+b^{2}+c^{2}}\right)^{2} + \left(\frac{pc}{a^{2}+b^{2}+c^{2}}\right)^{2}$  $= \frac{p^{2}(a^{2}+b^{2}+c^{2})^{\alpha}}{(a^{2}+b^{2}+c^{2})^{2}}$  $=\frac{p^2}{a^2+b^2+c^2}$ 

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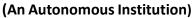
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3) A suctangular box open at the top is to that equive the least material for its construction  
that require the least material for its construction  
Let the dimension of the box be 
$$\pi, y, z$$
.  
Volume =  $\pi yz$ .  
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(Dxn =) ny + 223 +. 7743 =0 (2) xy => xy + 2 yz + 2 xyz = 0 2723-243=0  $\Rightarrow \chi = y$ 801re (2)& (3): >xy: xy+ 293+ 2xy 3 = 0 3×3: 243+233+ 273+ 2743=0 24-232=0 ⇒ 4=23. · · x=y=23

Sub: n=y= 23 in ()  $\mathcal{H} + 2\left(\frac{\alpha}{2}\right) + \mathcal{H}(\alpha)\left(\frac{\alpha}{2}\right) = 0$  $n+n+\frac{3n^2}{1}=0$  $=) \frac{2\pi^2}{2} = -2\pi$ =) 2 = - 4/2

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Sub n=y= 23 in @ 2+23+3(23)=0 y+2 y+ 3 y.y = 0 =) y = -4/3sub n= y= 23 in 3 24+27+224=0 2(23)+2(23)+7(23)(23)=0 43+43+43=2=0 2+ #33=0 =) 3=-2/2 OF = 243-32 =) === =) >143 = 32 =) -  $\frac{4}{2} \times \frac{4}{3} \times \frac{2}{3} = 32$ ヨー1=ス のうみ=-1. · n= 4, y=4, 3=2 : 7 = ny + 2yz + 2zn. = 4(4)+2(4)(2)+2(2)(4) = 16+16+16 = 48



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Find the dimensions of the rectangeder box without top of mani capacity with surface area 432 Squ. metre. Ans: 21= y = 23, 12, 12, 6. 2 = 864 cubic metres.

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