**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**COLLEGE OF ENGINEERING**

**MATH 252**

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**INDEX NUMBER:3552118**

1a. Construct a mathematical equation for this cooling tower.

Let

-1

Let the minimum radius be 10m since a hyperboloids symmetric is taken about the xy-plane and the minimum radius will occur on the xy-plane. Thus, the intersection of the hyperboloid with the xy-plane will be a circle of radius 10m.

Therefore

-2

Let z=0 since we are considering the xy-plane

-3

Equating 1 and 2 considering the xy-plane

Put

If the height of the tower is 40m then the length of the tower is 20m each above and below the xy-plane.At height z=20 the cross-section of the hyperboloid will have a radius of 15m

The circle will be at the intersection between the plane z=0 and the hyperboloid.

Put z=20 in equation 1

100(

=100

Comparing 4 to

Therefore the mathematical equation for this cooling tower is

1. If lies on your equation in Q1A

From the question given, x=acos(u)cosh(v), y=bsin(u)cosh(v), z=csinh(v)

Given

-t

Therefore,

Replacing the values of a,b and c in the equations.

x=10cos(u)cosh(v)

y=10sin(u)cosh(v)

z=sinh(v)

Put the values of a,b and c into equation t.

=

=

=()

=

Therefore (x,y,z)lies on the equation

1. A colleague at the same institution want to construct the cooling tower using a hyperbolic cylinder, give reason for your result in Q1A as the best model of the design of cooling tower.

My model can be said to be the best model of the design because it leads to rapid convection and heat dissipation and it also maximises, also from the conic surfaces we know that the equation of hyperbolic cylinders is . This equation creates two surfaces which diverges from each other and do not meet and on the other hand the hyperbiod of one sheet is one surface which encloses itself and is continuous making it a good choice for a cooling tower. The hyperboloid also encloses itself as in the shape of the resources for its construction to the maximum,

Cooling towers are also used to reject waste to the atmosphere by cooling water to a lower temperature. The shape that the hyperboloid forms encloses itself thereby making it suitable for rapid conversion and optimal heat dissipation than the hyperbolic cylinder which forms shapes which diverge from each other.

2a, Show that the rate of change of the mass m of the fluid contained in a region Q is

Given that a fluid has density no sources or sinks.

Mass of fluid(m)=volume

Volume(v)=

Thus

Total mass ()=

In region Q

Thus the instant time mass of fluid through a small region in Q is

In three dimensions

Therefore the mass charge with time is given by

B. Suppose further that, if the fluid crosses the boundary, show that

Since the mass decreases in the container as it flows across the boundary

Considering the fluid passes through a cross section

Thus

Where dA=nds

Volume=height

Therefore

1. Using the result from Q2(A) and Q2(B), show that =0

From a and b

=

Using stokes theorem

Therefore

=0

1. Why the continuity for water is given by

Since the density of water does not depend on time and water is known to be an incompressible fluid. =

Therefore,