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**University Examinations 2015/2016**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DIPLOMA IN ELECTRICAL ENGINEERING AND DIPLOMA IN CIVIL ENGINEERING.

**SME 2300: ENGINEERING MATHEMATICS V.**

**DATE: APRIL 2016 TIME:11/ 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Find the roots of the polynomial  (4 marks)
2. Calculate the surface area and volume of a cone whose base radius is 12.6 cm and height is

 23.4 cm. (4 marks)

c) Factorise the polynomial expression  and hence solve the equation, given that $x+4$ is a factor of . (4 marks)

d) The water in a measuring container rose from 25.2 cm3 to 39.4 cm3 mark when a solid metal sphere is completely immersed into it. Calculate the surface area of the sphere. (5 marks)

e) Given that , find curl F at the point $(2,0,3)$ (5 marks)

f) A right pyramid has a rectangular base 18cm by 12cm and a height 27cm. Determine its total surface area. (4 marks)

g) Find the divergence of each of the following vector fields:

(i)  (2 marks)

(ii)  (2 marks)

**QUESTION TWO (15 MARKS)**

1. The equation  has a solution near 0.8. use Newton-Raphson method to find the solution correct to 3 decimal places. (7 marks)
2. The diagram below shows a frustum of base radius 20cm and top radius 30cm. The height of the frustum is 28cm. Calculate
3. The height of the core from which the frustum was cut. (3 marks)
4. The volume of the frustum. (5 marks)

**QUESTION THREE (15 MARKS)**

1. Given that , evaluate
2.  at $u=3$ (3 marks)
3.  at $u=3$ (3 marks)
4. A right pyramid on a square base 12 cm is 22.5 cm high. If its cut at a height 9 cm from the bottom, determine;
5. The dimension of the top square (3 marks)
6. The total surface area of the frustum of the pyramid. (6 marks)

**QUESTION FOUR (15 MARKS)**

1. , evaluate  along the curve defined by , between

$A(0$, $0, 5)$ and $B(4,4,7).$ (6 marks)

1. (i) State the stokes theorem (2 marks)

(ii) A surface S consists of the part of the cylinder between $z=0$ and $z=4$ for  and the two semicircles of radius 3 cm in the planes $z=0$ and $z=4$. If , evaluate curl F.ds over the surface using stokes theorem. (7 marks)

**QUESTION FIVE (15 MARKS)**

1. If , determine grad at the point $p(1,3,2)$ (4 marks)
2. The figure below shows a model of a storage tank whose total height is 30cm made up of a conical top, a hemispherical bottom and a middle part that is cylindrical. The radius of the core and that of the hemisphere is 6 cm. The height of the cylindrical part is 16cm.
3. Calculate the external surface area of the model. (6 marks)
4. Calculate the volume of the model. (5 marks)