



MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR SECOND TERM EXAMINATION FOR

DIPLOMA IN MECHANICAL ENGINEERING

MATHEMATICS II

DATE: 4/6/2021

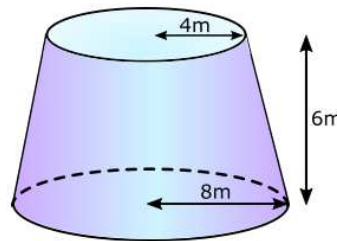
TIME: 8.30-11.30 PM

INSTRUCTIONS:

Answer **ALL** the questions.

ALL questions carry equal marks

1. The volume of a cone can be calculated using the formula $V = \frac{1}{3}\pi r^2 h$ and the area of the curved surface of a cone can be calculated using $A = \pi r l$ (where r is the radius and l is the slant height).
 - a) Calculate the volume of this frustum;
 - b) Calculate the total surface area of this frustum.



2.
 - a) Differentiate the following with respect to x .
 - i) $y = \frac{4x+1}{x-2} \quad x > 2$
 - ii) $y = x^2 \cos 3x$

(11 marks)

- b) Find the value of $\frac{dy}{dx}$ at the point where $x = 2$ on the curve with the equation
 $y = x^2(5x-1)$ (9 marks)
3. a) Determine
 i) $\int x \cos(x^2 + 5) dx$
 ii) $\int_0^1 \frac{x dx}{\sqrt{1+4x^2}}$ (10 marks)
- b) Determine $\int \frac{6x^2+7x-25}{(x-1)(x+2)(x-3)} dx$ (10 marks)
4. a) i) If $a = 5i - 2j$ and $b = -i + 8j$, find $3a - b$.
 ii) Determine the direction angle θ of the vector $w = -4i - 3j$. (10 marks)
- b) Resolve a force of 10N into two components if it acts at an angle of 30° with the horizontal. (10 marks)