(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2015/2016 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DIPLOMA IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: DCE 052

COURSE TITLE: APPLIED MECHANICS

DATE: MONDAY 7TH DECEMBER 2015 TIME: 9.00 – 11.00 PM

INSTRUCTIONS:

1. This paper consists of SIX Questions
2. Answer Question One and any other FOUR Questions
3. Examination duration is **2 Hours**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over.

QUESTION ONE (30MKS)

A) Integrate the following expressions with respect to

I, $\frac{1}{2x}$

Ii e^{4-5x} Type equation here.

iii, $\frac{3x}{(x-1)(x-2)}$

iv, $\frac{1}{3x+1}$

Find the derivatives of the following from first principles.

I, $cosx$

Ii, $2sinx - 3\,cosx$

Iii, $logx$ $iv,$ $2inx$

C, If $f(x) = \frac{3}{4} - x\ and\ g(x) = \frac{1}{x} find$ $i, (fog)(x)$ $ii, (gof)(x)$

d) Given that log a$^{(m)}$=r and log a $^{1/n}$=s show that m=n a^{r+s}

ii,Express $\frac{2}{(x+1)\left(x^{2}-x-1\right)}$ $into\ partial\ fractions$

iii, if $\log_{10}2$=a show that $\log_8 5 = \frac{(1-a)}{3a}$

QUESTION TWO (10MKS)

Expand simplify the following function and write down its derivative

$$\sin\left(x + \frac{\pi}{2}\right)$$

QUESTION THREE (10MKS)

Use Simpson's rule to find an approximate value for $\int_0^n \sqrt{\sin\theta}\delta \quad \theta$

QUESTION FOUR (10MKS)

The area enclosed by the curve y=4x-x^{2}and the line y=3 is rotated about the line y=3.Find the volume of the solid generated.

QUESTION FIVE (10MKS)

I, A spherical balloon is blown up so that its volume increases at aco0nstant rate of 2cm$^{3/S}$. Find the rate of increase of the radius when the volume of the balloon is 50cm^3.

Ii, A vessel containing water is in the form of an inverted hollow cone with a semi vertical angle of 30^0.There is a small hole at the vertex of the core and the water is running out at arate of 3cm$^{3/f}$ind the rate at which the surface area in contact with the water is changing when there are81πcm^{3}of water remaining in the cone.

QUESTION SIX (10MKS)

Differentiate

I, e^{3x}

ii, $3\sin(e^x)$

iii, $\sin 2x$

Iv, $\frac{1}{x2+1}$

v. $\frac{x-1}{x\sqrt{(x2+1)}}$