

TECHICAL UNIVERSITY OF MOMBASA Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12 J) DIPLOMA IN ARCHITECTURE (DA 12J)

AMA 2314: ENGINEERING MATHEMATICS

END OF SEMESTER EXAMINATION SERIES: APRIL 2013 TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet
- Mathematical Tables
- Scientific Calculator

This paper consists of **FIVE** questions. Answer any **THREE** questions Maximum marks for each part of a question are as shown This paper consists of **THREE** printed pages **Question One**

a) Use L'Hospital's Rule to determine the limit of the following functions:

(i) (ii)

y''+11y'+24y = 0, y(0) = 0, y'(0) = -7given b) (i) Solve the following initial value problem (IVP)

- $f(x) = \frac{1}{3}x^3 + 2x$
- satisfies the hypothesis of the mean value theorem on the interval (ii) Show that
 - (0, 3). Determine all the values of C.

$$L\left\{\frac{1}{26}\right\}$$

c) Evaluate

Question Two

y''-10y'+9y = 5t y(0) = -1, y'(0) = 2 given (10 Mark a) Use Laplace transform to solve the following IVP,) (10 Marks)

, has a limiting value of 4.

b) (i) Evaluate

$$L^{-1}\left\{\frac{6}{s} - \frac{1}{s-8} + \frac{4}{s-3}\right\}$$

 $\int_{1}^{2} \int_{0}^{3} \int_{0}^{1} 8xyz \, dzdx \, dy$

 $x \rightarrow 2$, $f(x) = \frac{x^2 - 4}{x - 2}$

c) Evaluate:

Question Three

(3 marks)

(3 marks)

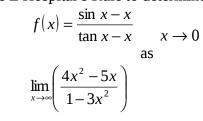
(4 marks)

(2 marks)

(5 marks)

(8 Marks)

(5 marks)



 $\int_{a}^{\sqrt{x^2}} \int_{a}^{e^{x/y}} dy dx$

 $\lim_{x\to\infty}\left(\frac{3n-2}{5n+4}\right)$

 $\frac{d^2 y}{dx^2} + 4\frac{dy}{dx} = 6$

a) (i) Evaluate

(ii) Evaluate:

b) (i) Solve,

(ii) Determine whether

 $\int_{-\infty}^{+\infty} \frac{4x^3 dx}{(1+x^4)}$

Question Four

- a) (i) A metallic box 5cm long, 3cm wide and 2.5cm high is influenced by temperature changes. Find the change in volume when the length is increased by 0.25 width is decreased by 0.15 and height is decreased by 0.05. (4 marks)
 - (ii) Use Taylor's series method to determine the value of tan 52° (6 decimal places). (6 marks)

 $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$

(i) Given find the value of
$$\int_{0}^{1} \frac{1}{\sqrt{x}} dx$$
(ii) Determine divergency, or convergency, given

(11) Determine divergency or convergency, given

 $u = \sin^{-1}\left\{\frac{x}{y}\right\} + \tan^{-1}\left\{\frac{y}{y}\right\}$

Question Five

b)

$$2y''+3y'-2y = te^{-2t}, y(0) = 0, y'(0) = -2$$

a) Using Laplace transform solve,

b) Evaluate:- $L\left\{6e^{-5t}+e^{3t}\right\}$ i) $L\{4\cos(4t) + 9\sin(4t)\}$

(8 marks)

(4 marks)

(4 marks)

(4 marks)

(2 marks)

(8 marks)

(4 marks)

(10 marks)

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$\int \tan^n x dx$

- c) (i) Evaluate
 - (iii) Test for convergency, given:

 $\int_{0}^{1} \ln x \, dx$

(4 marks)

(2 marks)