



MURANG'A UNIVERSITY COLLEGE

A constituent college of Jomo Kenyatta University of Agriculture and Technology

University Examination 2014/2015

END OF SEMESTER EXAMINATION FOR THE DIPLOMA IN CIVIL ENGINEERING

SEB 1351 ENGINEERING MATHEMATICS V

DATE: 7TH DECEMBER 2015 TIME: 2 HOURS

Instructions: Attempt question **One** and **Two** other questions

QUESTION 1 (30 marks)

- a. Define the term differential equation **(1mk)**
- b. Differentiate between order and degree of a differential equation **(2mks)**
- c. Given that $A = \begin{pmatrix} 2 & 1 \\ 3 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 5 \\ 6 & 4 \end{pmatrix}$, find
- i. $A + B$ **(3mks)**
- ii. $A \times B$ **(4mks)**
- iii. The determinant of B **(4mks)**
- d. Find the order and degree of the differential equations
- i. $\frac{dy}{dx} + 3\frac{d^2x}{dy^2} - 2 = 0$ **(2mks)**
- ii. $2\left(\frac{dy}{dx}\right)^3 + \frac{d^2y}{dx^2} + y = 0$ **(2mks)**
- e. Find the differential equation associated with $y = bx - ax^2$ **(6mks)**
- f. Use the integrating factor method to solve the differential equation
- $\frac{dy}{dx} + y = e^x$ **(6mks)**

QUESTION 2 (20 MARKS)

a. Given the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 1 & 5 \\ 6 & 0 & 2 \end{bmatrix}$, find

i. determinant **(3mks)**

ii. transpose **(2mks)**

b. Solve the simultaneous equations using matrices.

$$x + 2y + z = 4$$

$$3x - 4y - 2z = 2$$

$$5x + 3y + 5z = -1$$

(15marks)

QUESTION 3 (20MARKS)

a. Solve the following simultaneous equations using gauss elimination method

$$x + 2y - 3z = 3$$

$$2x - y - z = 11$$

$$3x + 2y + z = -5$$

(15mks)

b. Find the eigenvalues of $\begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$ **(5mks)**

QUESTION 4 (20MKS)

Solve the following differential equations

i. $\frac{dy}{dx} = 2 + y$ (5mks)

ii. $\frac{dy}{dx} = \frac{2x+1}{y-2}$ (5mks)

iii. $xy \frac{dy}{dx} = \frac{1+y^2}{14}$ (5mks)

iv. $2 \frac{d^2y}{dx^2} + 5 \frac{dy}{dx} + 3y = 0$ (5mks)

QUESTION 5 (20 marks)

a. Find the value of the following where D is the operator D

i. $D^2(\cos 2x + e^{3x} + 8)$ (4mks)

ii. $\frac{1}{D}(\sin 3x + 5x^2 + 4x^{\frac{1}{2}})$ (4mks)

b. Solve the following homogenous equation by applying $y = vx$. (8mks)

$$(x^2 - y^2)dx + 2xydy = 0$$

c. Find the general solution of the differential equation (4mks)

$$\frac{d^2y}{dx^2} + 9y = 0$$