



MACHAKOS UNIVERSITY

University Examinations 2019/2020

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND ELECTRONICS (TVET)

ENGINEERING MATHEMATICS II

DATE: 23/3/2020

TIME: 8.30-11.30 AM

INSTRUCTIONS:

This paper consists of five questions, attempt ALL.

QUESTION ONE

- a) Solve for x and y using substitution method (4 marks)
- $$3x + 4y = 5$$
- $$x - 2y = 6$$
- b) Solve the following equations by elimination method (4 marks)
- $$2x - 3y = 4$$
- $$3x + 4y = 5$$
- c) Find the quadratic equations whose roots are;
- i. -2 and 3
- ii. -3 and 4 (6 marks)
- d) Solve $\frac{y+1}{y-1} = y - 2$ (6 marks)

QUESTION TWO

- a) Write a unit matrix of 3 by 3 (3 marks)
- b) Define the following terms used in the matrices citing example for each (7 marks)
- i. Square matrix
- ii. Column matrix
- iii. Row matrix

c) Given that

$$A = \begin{pmatrix} 2 & 6 & -2 \\ 3 & 4 & 9 \\ 2 & 3 & 6 \end{pmatrix} \text{ and } B = \begin{pmatrix} 12 & -2 & 8 \\ 4 & 8 & 4 \\ 0 & 2 & -6 \end{pmatrix}$$

(10 marks)

Determine

i. $A+B$

ii. $2A - \frac{1}{2}B$

iii. AB

QUESTION THREE

a) Solve equation $\frac{1}{x+1} = 15 - \frac{1}{x+4}$

(4 marks)

b) Obtain the expansion of $\left(2x - \frac{1}{2}\right)^4$, in descending powers of x

(6 marks)

c) Use pascal's triangle to obtain the values of the following, and correct to six places of decimal

(10 marks)

i) $(1.002)^5$

ii) $(0.002)^5$

QUESTION FOUR

a) Determine the angle between the vectors $A = 2i + 3j + 6k$ and $B = 6i - 4j + 6k$ (7 marks)

b) Given that $\phi = x^2 y^3 z^4$ and $A = 3x^2 yi + 6xy^2 z^2 j - 4xy^2 z^2 k$. Determine at (1,1,1). (13 marks)

i. $\nabla \phi$

ii. $\nabla \cdot F$

iii. $\nabla \times F$

QUESTION FIVE

a) Given that $A = \begin{pmatrix} 2 \\ -7 \end{pmatrix}$ and $B = \begin{pmatrix} -10 \\ -3 \end{pmatrix}$ find;

i. $2A - 3B$

(6 marks)

ii. $A + (-6B)$

b) Find the angle between the vectors $r_1 = i + j + k$, $r_2 = -i + 2j + 3k$

(6 marks)

c) In figure below, $\vec{OS} = 2r$ and $\vec{OQ} = \frac{3}{2}p$. Given that $\vec{QK} = m\vec{QR}$ and $\vec{PK} = n\vec{PS}$, find two

distinct expressions for in terms of p, r, m and n , for $\vec{OK}$. By equating these expressions, find the values of m and n hence evaluate the ratios $QK : KR$ and $RK : KS$ (8 marks)

