

Instructions to candidates

Duration: One(01) hour

Number of questions: Two(02) Essay Questions

Mark allocation: 100 mark

Use standard symbols without definition.

Scientific calculators are allowed.

Answer all questions

1.

a. Define the following terms.

- i. matrix (03 mark)
- ii. column matrix (02 mark)
- iii. identity matrix (03 mark)

b. Let $A = \begin{pmatrix} 3 & 0 & 6 \\ 5 & -5 & 7 \\ 1 & 3 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 2 & 3 \\ 10 & 0 & 5 \\ 6 & -1 & -5 \end{pmatrix}$, find:

- i. $2A+B$ (03 mark)
- ii. product of matrix A and matrix B (06 mark)
- iii. transpose of matrix A (03 mark)

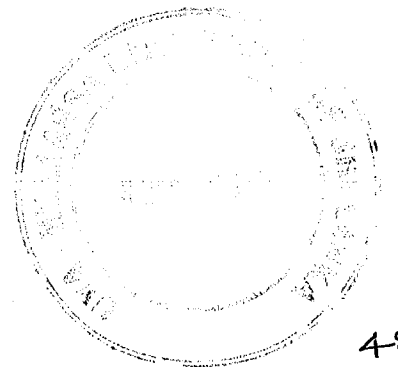
c. Find x such that $\begin{vmatrix} x & x+1 \\ 2 & x+2 \end{vmatrix} = 0$. (05 mark)

d. Find the *minors, cofactors, adjoint matrix* and *inverse matrix* of the following matrix C . (15 mark)

$$C = \begin{pmatrix} 1 & 3 & 5 \\ 2 & -1 & 4 \\ 1 & 0 & -7 \end{pmatrix}$$

e. Use **Cramer's rule** to solve the following system of linear equations. (10 mark)

$$\begin{aligned} -x + 2y + 3z &= -7 \\ -4x - 5y + 6z &= -13 \\ 7x - 8y - 9z &= 39 \end{aligned}$$



2.

a. Find the magnitude and direction cosines of the vector $3i - j - 4k$. (05 mark)

b. Determine the unit vector parallel to the vector $3i + 6j - 2k$. (04 mark)

c. If $A = 3i - j + 2k$ and $B = 2i + j - k$, determine:

i. the dot product of A and B .

ii. the cross product of A and B .

(03 mark)

(05 mark)

d. Find the angle between two vectors, where $C = 3i + 2j - 6k$ and $D = 4i - 3j + k$.

(04 mark)

e. For any $z \in \mathbb{C}$, prove that $z\bar{z} = |z|^2$.

(05 mark)

f. Solve the equation $2x^2 + 3x + 2 = 0$ for x .

(04 mark)

g. Write the z in the form of $x + iy$;

$$z = \frac{2+3i}{1+i}$$

(04 mark)

h. Determine the modulus and principle argument of $-1 + \sqrt{3}i$.

(06 mark)

i. If $w = \frac{3\sqrt{3}}{2} + \frac{3}{2}i$, then find:

i. the polar form of w .

(06 mark)

ii. the exponential form of w .

(04 mark)
