Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
200 Level 1st Semester Examination –Jul./Aug. 2016
SCT 201-1 Abstract Algebra

Uva Wellassa University

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)

$$-x+2y+3z=-7$$
$$-4x-5y+6z=-13$$
$$7x-8y-9z=39$$

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2.

a. Find the magnitute 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. (03 mark)
ii. the cross product of A and B. (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 ploar form of w. (06 mark)
ii. the exponential form of w. (04 mark)

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