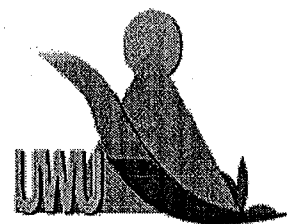


Uva Wellassa University, Sri Lanka.
End Semester Examination - February, 2011
SCT 303-1 Mathematical methods

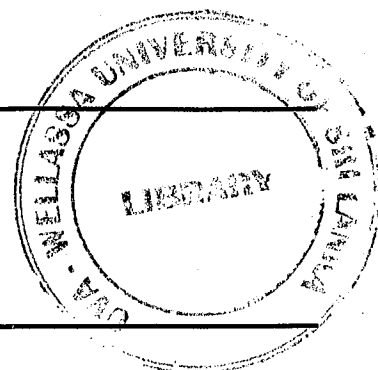


Time : One (1) hour

Answer all questions.

Calculators are allowed.

Total two(2) pages.



1. What is meant by Vector Cross Product?

(4 marks)

- a) Considering the following Modified Propeller (Figure 01), which is introduced to a ship, find its surface area. (Hint :-The propeller composes 4 similar parallelograms and the shape is three dimensional)

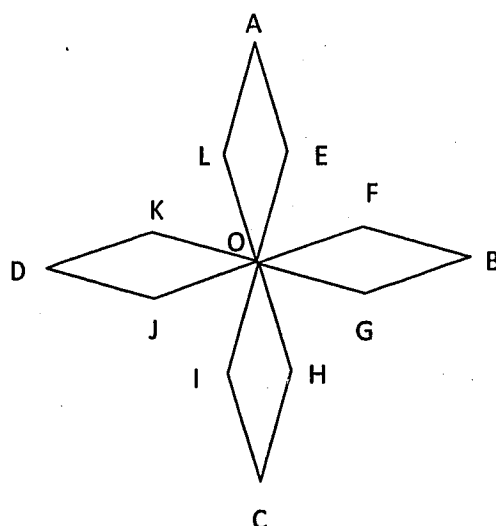


Figure 01: Modified Propeller

Vector	Position
A	$4j$
B	$4i$
C	$-4j$
D	$-4i$
E	$i + 2j + k$
F	$2i + j - k$
G	$2i - j + k$
H	$i - 2j - k$
I	$-i - 2j + k$
J	$-2i - j - k$
K	$-2i + j + k$
L	$-i + 2j - k$
O	0

(24 marks)

2. State the Green's theorem with the proper identification of the terms.

(4 marks)

- a) An astrologist, who is doing experiments on a asteroid, is found that the motion of the asteroid is along the path bounded by the region enclosed by the circle $x^2 + y^2 = 4$ due to a force field $(x^3 - x^2y)\mathbf{i} + xy^2\mathbf{j}$.
Find the work done by the force after finishing one cycle of the asteroid, by the means of the Green's theorem.

(32 marks)

3. State the Divergence theorem with the proper identification of the terms.

(4 marks)

- a) A helicopter is being designed to fly through the wind of having force field $(2xy + z)\mathbf{i} + y^2\mathbf{j} - (x + 3y)\mathbf{k}$ and engineers have designed the shape of the helicopter as the common region of intersection of regions $8 - (x^2 + y^2) = z$ and $-8 + (x^2 + y^2) = z$.
Find the surface integral due to the motion of the wind for an instant when the helicopter is not having any motion in the air.

(32 marks)