

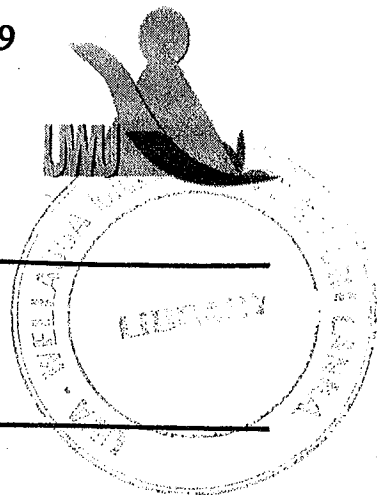
Uwa Wellassa University, Sri Lanka.  
End Semester Examination - December 2009  
SCT 303-1 Mathematical Methods

Time : One (1) hour

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Answer all questions.  
Calculators are allowed.  
Total one (1) page.

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- 1) a) State the Green's theorem with proper identification of terms.

(4 marks)

- b) A astrologist who is doing experiments on a asteroid is found that the motion is along the path bounded by the region enclosed by the circle  $x^2 + y^2 = 4$  due to a force  $(x^3 - x^2y)\mathbf{i} + xy^2\mathbf{j}$ .

Find the work done by the force after finishing one cycle of the asteroid by the means of the green's theorem.

(28 marks)

- 2) a) State the Divergence theorem with the proper identification of terms.

(4 marks)

- b) A plane is 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 plan as the common region of intersecting regions  $8 - (x^2 + y^2) = z$  and  $-8 + (x^2 + y^2) = z$ .

You are required to calculate the surface integral of the plane due to the motion of the wind by the means of the divergence theorem.

(28 marks)

- 3) a) State the Stokes' theorem with the proper identification of terms.

(4 marks)

- b) Verify the Stokes' theorem for  $\mathbf{F} = 2y\mathbf{i} + 3x\mathbf{j} - z^2\mathbf{k}$ , where the surface is upper half of the sphere  $x^2 + y^2 + z^2 = 9$ .

(32 marks)