Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 level 2nd Semester Examination – Dec./Jan. 2018/19
SCT 378 – 1 Vector Calculus

Uva Wellassa University

Instructions to candidates
No. of pages : Two (02)
No. of questions : Two (02) Essay questions
Time allocation : One (01) hour
Marks allocation : 100 mark
Answer All Questions

01.

a) Find the directional derivative of the function $f(x,y,z)=3xy+z^2$ at the point (1, -2, 2) in the direction from that point to the origin. (mark 20)

b) Verify the fact that $div(curl\vec{F})=0$ for the vector field $\vec{F}=yz^2\,\vec{i}+xy\,\vec{j}+yz\,\vec{k}$ (mark 20)

02.

a) Evaluate $\int_C (2+x^2y)\,ds$, where C is the upper half of the unit circle $x^2+y^2=1$. (mark 15)

b) i.) If $\vec{F}(x,y)=(3+2xy)\vec{i}+(x^2-3y^2)\vec{j}$, find a function f such that $\vec{F}=\nabla f$. (mark 15)

ii.) Evaluate the line integral $\int_C \vec{F}\cdot d\vec{r}$, where C is given by $\vec{r}(t)=e^t\sin t\,\vec{i}+e^t\cos t\,\vec{j}$,

$0\le t\le \pi$. (mark 10)

c) Use the Stoke's Theorem to evaluate $\iint_S curl\,\vec{F}\cdot ds$, where $\vec{F}(x,y,z)=xz\,\vec{i}+yz\,\vec{j}+xy\,\vec{k}$ and S is the part of the sphere $x^2+y^2+z^2=4$ that lies inside the cylinder $x^2+y^2=1$ above the xy – plane. (mark 20)

107