VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCE
DEPARTMENT OF MATHEMATICS
Continuous Assessment Test-II, September-2018
B.Tech, Fall Semester-2018-19

Course Code : MAT1011
Course Name : CALCULUS FOR ENGINEERS
Slot: B2+TB2

Duration : 90 Minutes
Max. Marks : 50M

ANSWER ALL THE QUESTIONS

1 (a) Given that $f(x,y)=x^3y-y^3x,\ x=uv,\ y=\frac{u}{v}$ find $\frac{\partial f}{\partial u},\frac{\partial f}{\partial v}$ [7M]

(b) If $u=f(x,y,z)$ and $x=r\sin\theta\cos\phi,\ y=r\sin\theta\sin\phi,\ z=r\cos\theta$, then evaluate

$$\left(\frac{\partial f}{\partial x}\right)^2+\left(\frac{\partial f}{\partial y}\right)^2+\left(\frac{\partial f}{\partial z}\right)^2$$ [8M]

2 (a) Expand $f(x,y)=21+x-20y+4x^2+xy+6y^2$ in Taylor series expansion of maximum order about the point $(-1,2)$ [7M]

(b) A Cylindrical storage tank is to be designed for storing hot water from a solar energy collection system. The volume is given as $2m^3$ and the surface area is to be minimized in order to minimize the heat loss to the environment. Solve this problem by using suitable method. [8M]

3 Evaluate the integral by first reversing the order of integration $\int_0^3\int_{\frac{y}{2}}^{2}\sqrt{x^4+1}\,dx\,dy$. [10M]

4 Evaluate $\iiint_E 2x\,dV$ where E is the region under the plane $2x+3y+z=6$ that lies in the first octant. [10M]

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