VIT
Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES
DEPARTMENT OF MATHEMATICS
CONTINUOUS ASSESMENT TEST II

FALL SEMESTER-2018-19
CALCULUS FOR ENGINEERS

Course code: MAT1011
Course: Iyr. B.Tech/MIS
Slot: E2 + TE2

Max. marks: 50
Time: 90 minutes

Answer ALL questions

1a). If $z = f(u, v)$ where $u^2 = x^2 - y^2$, $v = 2xy$, then prove that

$$\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = 4(x^2 + y^2)^2\left[\left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2\right]$$ (7 Marks)

b). Verify whether the functions $u = y + z$, $v = x + 2z^2$, $w = x - 4yz - 2y^2$ are functionally dependent, if so find the relation between them. (8 Marks)

2a).Find the Taylor's series expansion of cos(xy) in powers of $(x - 1)$ and $(y - \pi/2)$ up to second degree terms. (7 Marks)

b) Find the maximum and minimum values of $f(x, y, z) = y^2 - 10z$ subject to the constraint $x^2 + y^2 + z^2 = 36$ (8 Marks)

3). Change the order of integration and evaluate the integral $\iint (x^2 + y^2)\, dx\, dy$ where the region of integration is bounded by $x = y^2$; $x = 3 - y$; $y = 0$; $y = 2$ (10 Marks)

4).Evaluate $\iiint (10xz + 3)\, dzdydx$ where the region is portion of sphere $x^2 + y^2 + z^2 = 16$, with $z \geq 0$, by transforming in to spherical polar coordinates. (10 Marks)