Integrated MCA-I (Second Semester)
Mid-Semester Examination 2015-16
School of Technology, Doon University Dehradun
Mathematics-II (STM-511)

Time: 2:00-4:00PM   Total Marks: 30

Note: (i) Attempt ALL the questions. (ii) Do neat and clean work.

Section A

Attempt ALL: (3x2=6)

1. Evaluate $\int_0^{\pi/2} \int_0^{a\cos\theta} \int_0^{\sqrt{a^2-r^2}} r\,dz\,dr\,d\theta$.

2. Change the order of integration $\int_0^a dx \int_x^{a^2/x} f(x,y)\,dy$.

3. If $u = x\log(xy)$ where $x^3 + y^3 + 3xy = 1$, find $\frac{du}{dx}$.

Section B

Attempt ALL: (4x3=12)

1. If $v = (x^2 + y^2 + z^2)^{m/2}$, then find the value of $m (m \neq 0)$, which make $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$.

2. If $x^x y^y z^z = c$, show that at $x = y = z, \frac{\partial^2 z}{\partial x \partial y} = -(x\log ex)^{-1}$.

3. Find the area of curve $\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{b}\right)^{2/3} = 1$.

Section C

Attempt any THREE: (4x3=12)

1. Prove that if the perimeter of a triangle is constant. Its area is maximum when the triangle is equilateral.

2. State and prove Euler's theorem on homogeneous function.

3. Change the order of integration $\int_0^a dx \int_x^{a^2/x} f(x,y)\,dy$.

4. Find the volume bounded by the cylinder $y^2 = x, x^2 = y$ and the planes $z = 0, x + y + z = 2$.