# KERALA AGRICULTURAL UNIVERSITY

**B.Tech (Food.Engg) 2013 Admission**

**III$^{rd}$ Semester Final Examination- December -2014**

**at. No: Basc.2108** **Marks: 50.00**

**itle: Engineering Mathematics -III** **Time: 2 hours**

art-I (answer all questions)

(5 x 3=15)

If $\bar{r} = xi + yj + zk$, prove that $\nabla(\bar{a}.\bar{r}) = \bar{a}$, where $\bar{a}$ is a constant vector.

Find the divergence and curl of the vector $\bar{F} = xyzi + 3x^2yj + (xz^2 - y^2z)$ k at the int $(2,-1,1)$.

Obtain the Fourier series of $f(x) = x$ in the interval $(0,2\pi)$.

Determine whether or not the function $x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ harmonic.

Evaluate $\int_c \frac{dz}{z-a}$ when (i) a is inside c (ii) a is outside c.

rt II (answer any five)

(5 x 5=25)

nd the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - z = 3$ at the point $(2,-1,2)$.

etermine the analytic function whose real part is $x^2 - y^2 - 2xy - 2x + 3y$.

xpand cosz in a Taylor series about $z = \pi/4$.

nd the half range sine series of $f(x) = (x-1)^2$ in the interval $(0,1)$.

valuate $\int_c \frac{e^z dz}{(z+1)^2}$ where c is $|z-3| = 3$.

nd the bilinear transformation which maps the points $z = 1, i, -1$ into $w = i, 0, -i$.

nd the Fourier integral of $f(x) = \begin{cases} 1 & \text{for } |x| \le 1 \\ o & \text{for } |x| > 1 \end{cases}$.

(1 x10=10)

t III (answer any one)

$f(x) = \begin{cases} 0 & \text{in } (-\pi,0) \\ \sin x & \text{in } (0,\pi) \end{cases}$, prove that $f(x) = \frac{1}{\pi} + \frac{\sin x}{2} - \frac{2}{\pi}\sum\frac{\cos 2nx}{4n^2-1}$.

se Green's theorem in a plane to evaluate the integral $\oint_c [(2x^2 - y^2)dx + (x^2 + y^2)dy]$ where c is boundary in the xy plane of the area enclosed by the X-axis and the semicircle $x^2 + y^2 = 1$ in upper half of xy- plane.