KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2013 Admission
III[rd] Semester Final Examination- December -2014

Cat. No: Basc.2108 **Marks: 50.00**
Title: Engineering Mathematics -III **Time: 2 hours**

Part-I (answer all questions)

(5 x 3=15)

1. If $\bar{r} = xi + yj + zk$, prove that $\nabla(\bar{a}.\bar{r}) = \bar{a}$, where $\bar{a}$ is a constant vector.
2. Find the divergence and curl of the vector $\bar{F} = xyzi + 3x^2yj + (xz^2 - y^2z)\,k$ at the point $(2,-1,1)$.
3. Obtain the Fourier series of $f(x) = x$ in the interval $(0,2\pi)$.
4. Determine whether or not the function $x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ harmonic.
5. Evaluate $\int_c \frac{dz}{z-a}$ when (i) a is inside c (ii) a is outside c.

Part II (answer any five)

(5 x 5=25)

6. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - z = 3$ at the point $(2,-1,2)$.
7. Determine the analytic function whose real part is $x^2 - y^2 - 2xy - 2x + 3y$.
8. Expand cosz in a Taylor series about $z = \pi/4$.
9. Find the half range sine series of $f(x) = (x-1)^2$ in the interval $(0,1)$.
10. Evaluate $\int_c \frac{e^z dz}{(z+1)^2}$ where c is $|z-3| = 3$.
11. Find the bilinear transformation which maps the points $z = 1, i, -1$ into $w = i, 0, -i$.
12. Find the Fourier integral of $f(x) = \begin{cases} 1 \text{ for } |x| \le 1 \\ 0 \text{ for } |x| > 1 \end{cases}$.

(1 x10=10)

Part III (answer any one)

13. If $f(x) = \begin{cases} 0 \text{ in } (-\pi,0) \\ \sin x \text{ in } (0,\pi) \end{cases}$, prove that $f(x) = \frac{1}{\pi} + \frac{\sin x}{2} - \frac{2}{\pi}\sum \frac{\cos 2nx}{4n^2 - 1}$.
14. Use Green's theorem in a plane to evaluate the integral $\int_c [(2x^2 - y^2)dx + (x^2 + y^2)dy]$ where c is the boundary in the xy plane of the area enclosed by the X-axis and the semicircle $x^2 + y^2 = 1$ in the upper half of xy- plane.