KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Ag. Engg.) 2017 Admission
III Semester Final Examination-January-2019

Basc.2108 **Engineering Mathematics-III (2+1)**

Marks: 50
Time: 2 hours

I **Fill in the blanks:** **(10x1=10)**

1 If $\vec{A}$ is solenoidal then div $\vec{A}$ = _____

2 The mapping $w = \frac{1}{z}$ is known as _____

3 The poles of $\frac{z+1}{z^2(z-2)}$ are _____

4 If f(x) is an even function then f(-x) = _____

5 If $\vec{r}(t)$ is the position vector of a moving particle ,then velocity is given by _____

6 $\nabla x a\vec{f}$ = _____(a is any scalar).

7 If the principal part of the Laurent's series expansion of f(z) about z = a has infinite number of terms then z = a is _____

8 $\int_{-C} f(z)dz$ = _____

9 The maximum of the modulus value of the directional derivative of the scalar function is-----

10 $\nabla(\vec{f}.\vec{g})$= _____

II **Write Short notes on ANY FIVE of the following** **(5x2=10)**

1 Show that an analytic function is constant, if its real part is constant.

2 Evaluate $\frac{1}{2\pi i}\int_C \frac{z^2+5}{z-3}dz$ where C is $|z| = 4$

3 Find the Taylor series expansion of $f(z) = e^z$ at z = 0

4 Determine the nature of singularity of the function $f(z) = \frac{z - Sinz}{z^3}$

5 Find ∇f where $f(x,y,z) = x^2 + y^2 - 2z^2$ at (1,1,1)

6 Find the velocity and acceleration at t=1/2 of a moving particle whose position at time t is given by $\vec{r}(t) = (t^2+1)i + (2t-1)j$

7 Find the Fourier sine transform of $2e^{-5x} + 5e^{-2x}$.

P.T.O

III **Answer ANY FIVE of the following** **(5x4=20)**

1 Find the directional derivative of the function $xy + yz + zx$ along the direction of $i + 2j + 2k$ at the point (1, 2, 0).

2 Show that $\vec{F} = e^x(2y+3z)i + 2e^x j + 3e^x k$ is irrotational and find its scalar potential.

3 Find the Fourier Cosine transform of $f(x) = \begin{cases} Cosx, & 0 < x < a \\ 0, & x > a \end{cases}$.

4 Show that the function $u = x^3 - 3xy^2$ is harmonic and find the analytic function whose real part is u.

5 Evaluate $\int_C \frac{zdz}{(9-z^2)(z+i)}$ where C is the circle $|z| = 2$ taken in the positive sense

6 Using residue theorem evaluate $\int_C \frac{z^2 dz}{(z-2)(z+3)}$ where C is the circle $|z| = 4$

7 Discuss the transformation $w = e^z$

IV **Answer ANY ONE of the following** **(1x10=10)**

1 Expand $f(z) = \frac{z}{(z-1)(2-z)}$ as a Laurent's series valid for

1) $|z| < 1$ 2) $|z| > 2$ 3) $|z-1| > 1$ 4) $1 < |z| < 2$

2 Use Gauss divergence theorem to evaluate $\iint_S \vec{F} . \hat{n}\, ds$ where S is the surface of rectangular parallelepiped $0 \le x \le a,\ 0 \le y \le b,\ 0 \le z \le c$ and $\vec{F} = x^2 i + y^2 j + z^2 k$.

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