Basc.2108

KERALA AGRICULTURAL UNIVERSITY

B.Tech.(Food Engg.) 2016 Admission

III Semester Final Examination-Janauary-2018

Engineering Mathematics-III (2+1)

Marks: 50
Time: 2 hours

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

1 Gradient of a scalar function is a scalar and the divergence of a constant is _____

Choose the Correct answer

2 $\text{div}(\text{grad}\phi) =$ _____

a 0 b $\text{div}(\phi)$ c $\text{grad}\phi$ d $\nabla^2\phi$

3 If $\phi = 2x^3y^2z^4$ then $(\nabla^2\phi)_{(1,1,1)} =$ _____

a 24 b 12 c 40 d 36

4 If f(x) is an odd function defined in (-L,L), what is the value of a_0

a 1 b 2 c 0 d 5

5 A certain function u(x,y) can be the real part of an analytic function if

a u satisfies C-R equation c u is harmonic

b u is a continuous function d None of these

6 The value of the integral $\int_C \frac{dz}{z^2} = 0$ where C is,

a $|z|=1$ b $|z-1|=2$ c $|z|=2$ d $|z-2|=1$

State True or False

7 The vector function is the gradient of a scalar function, then the function is conservative

8 If $f(x)=1, 0 < x < \infty$ can be represent as a Fourier integral.

9 If f(z) is analytic function, then kf(z) is also analytic function where k is a constant.

Define the following

10 Write Parseval's identity for Fourier Sine Transform

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

1 Show that the function $x^4 - 6x^2y^2 + y^4$ is harmonic.

2 Verify whether w=sin(x)cosh(y)+icos(x)sinh(y) is analytic or not.

3 The Laurent's series expansion of $\frac{1}{z(z-1)}$ valid in $|z|>1$ is .....

4 Find the Fourier cosine transform of e^{-x}.

5 Find the constant term in the Fourier series corresponding to $f(x)=\cos^2(x)$ expressed in the interval $(-\pi, \pi)$.

6 If $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$, then find $\nabla\left(\frac{1}{r}\right)$?

7 If $\bar{F} = (x-3y)\bar{i} + (y-2x)\bar{j}$ and C is the line segment from (0,0) to (3,1) then find $\int_C \bar{F}d\bar{r}$.

PTO

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

1 Find the directional derivative of $\phi = xy + yz + zx$ in the direction of the vector $\bar{i} + 2\bar{j} + 2\bar{k}$ at(1,2,0

2 Evaluate $\int (xdy - ydx)$ around the circle $x^2 + y^2 = 1$.

3 Evaluate $\int \{(xy + x^2)dx + (x^2 + y^2)dy\}$, where C is the square formed by the lines x = -1 to 1 and y = -1 to1using Green's theorem.

4 If for 0<x<L, the function f(x) has the expansion $f(x) = \sum_{n=1}^{\infty} b_n \sin(\frac{n\pi x}{L})$ then find $\int_0^L [f(x)]^2 dx$.

5 Find the Fourier Transform of $f(x) = \begin{cases} 1; & |x| < a \\ 0; & |x| > a \end{cases}$.

6 Find the Fourier transform of $e^{-|x|}$, then find $\int_0^{\infty} \frac{dx}{(x^2+1)^2}$.

7 Find the image of the circle |z|=2 by the transformation w=z+3+2i

IV **Write an essay on ANY ONE of the following** **(1x10=10)**

1 Evaluate $\int_0^{\infty} \frac{dx}{(x^2 + a^2)(x^2 + b^2)}$ using Fourier Transform.

2 Use divergence theorem to evaluate $\iint_S \bar{F} \cdot \hat{n} ds$ where $\bar{F} = x^3\bar{i} + y^3\bar{j} + z^3\bar{k}$ and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$.

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