ccF (R)

(Pages : 3)

B – 3284

Reg. No. : ....

Name : ....

Fifth Semester B.Tech. Degree Examination, December 2016
(2013 Scheme)
13.501 : ENGINEERING MATHEMATICS – IV (AFRT)
(Complex Analysis and Linear Algebra)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions, **each** question carries **4** marks.

1. Show that the function $f(z) = \sqrt{|xy|}$ is not regular at origin, although Cauchy Reimann equations are satisfied.

2. Evaluate $\oint_C \frac{3z^2 + z}{z - 1} dz$ where C is the circle $|z + 1| = 1$.

3. Find the singular points of $z(e)^{\frac{1}{z^2}}$.

4. Is the set S = {(2, 1, –2), (–2, –1, 2), (4, 2, – 4)} form a basis for R^3, why ?

5. Find two unit vectors orthogonal to (1, –1, 1) and (0, 4, 4).

PART – B

Answer **one full** question from **each** Module, **each** question carries **20** marks.

MODULE – 1

6. a) Show that the real and imaginary parts of an analytic function satisfies Laplace's equation.

   b) Determine the analytic function whose real part is $e^x(x \cos y - y \sin y)$

   c) If U and V are harmonic functions, show that $U_y - V_x + i(U_x + V_y)$ is an analytic function.

P.T.O.

7. a) Find the real part of the analytic function whose imaginary part is $\log(x^2 + y^2) + x - 2y$.

   b) Find the image of the infinite strip $\frac{1}{4} \leq y \leq \frac{1}{2}$ under the transformation $z = \frac{1}{z}$.

   c) Find the bilinear transformation which maps the points $z = 0, -i, -1$ into the points $w = i, 1, 0$ and find the image of the line $y = mx$ under this transformation.

MODULE – 2

8. a) Evaluate : $\oint_c \frac{e^z}{z^3\left(z^2+5z+6\right)} dz$. Where C is the circle $|z - 1| = 1$.

   b) Determine the residue at the poles of $\frac{2z+1}{\left(z^2-z-2\right)^2}$.

   c) Expand $f(z) = \frac{1}{z^2-z-6}$ about $z = -1$ and $z = 1$ and find the region of convergence.

9. a) Evaluate : $\int_0^{\pi} \frac{\cos^2 3\theta d\theta}{5-4\cos 2\theta}$.

   b) Evaluate : $\int_{-\infty}^{\infty} \frac{xdx}{\left(x^2+1\right)\left(x^2+2x+1\right)}$.

MODULE – 3

10. a) Express (2, 5, – 4, 0) as a linear combination of (2, –2, –5, 4), (1, 3, 2, 1) and (2, –1, 3, 6).

   b) Let $A = \begin{pmatrix} 1 & -2 & 1 & 1 & 2 \\ -1 & 3 & 0 & 2 & -2 \\ 0 & 1 & 1 & 3 & 4 \\ 1 & 2 & 5 & 15 & 5 \end{pmatrix}$. Find a basis for the column space of A.

11. a) Find the best least squares fit by a linear function to the data.

x	–1	0	1	2
y	0	1	3	9

b) Find the transition matrix from the basis $v_1 = (1, 2, 3)$, $v_2 = (1, 0, 1)$, $v_3 = (1, 2, 1)$ to the basis $u_1 = (1, 1, 0)$, $u_2 = (0, 1, 1)$, $u_3 = (1, 1, 1)$.

MODULE – 4

12. a) Find an orthonormal basis for the subspace of R^4 spanned by $(1, 1, 1, 1)^T$, $(2, 3, 2, -4)^T$ and $(-1, 5, -2, -1)^T$.

b) Reduce $8x^2 + 7y^2 + 3z^2 - 12xy + 4xz - 8yz$ into canonical form by orthogonal transformation and examine the definiteness.

13. a) Find a Singular value decomposition of $A = \begin{pmatrix} 4 & 11 & 14 \\ 8 & 7 & -2 \end{pmatrix}$.

b) Find a maxima or minima of $Q(X) = 9x^2 + 4y^2 + 3z^2$ where $XX^T = 1$.
