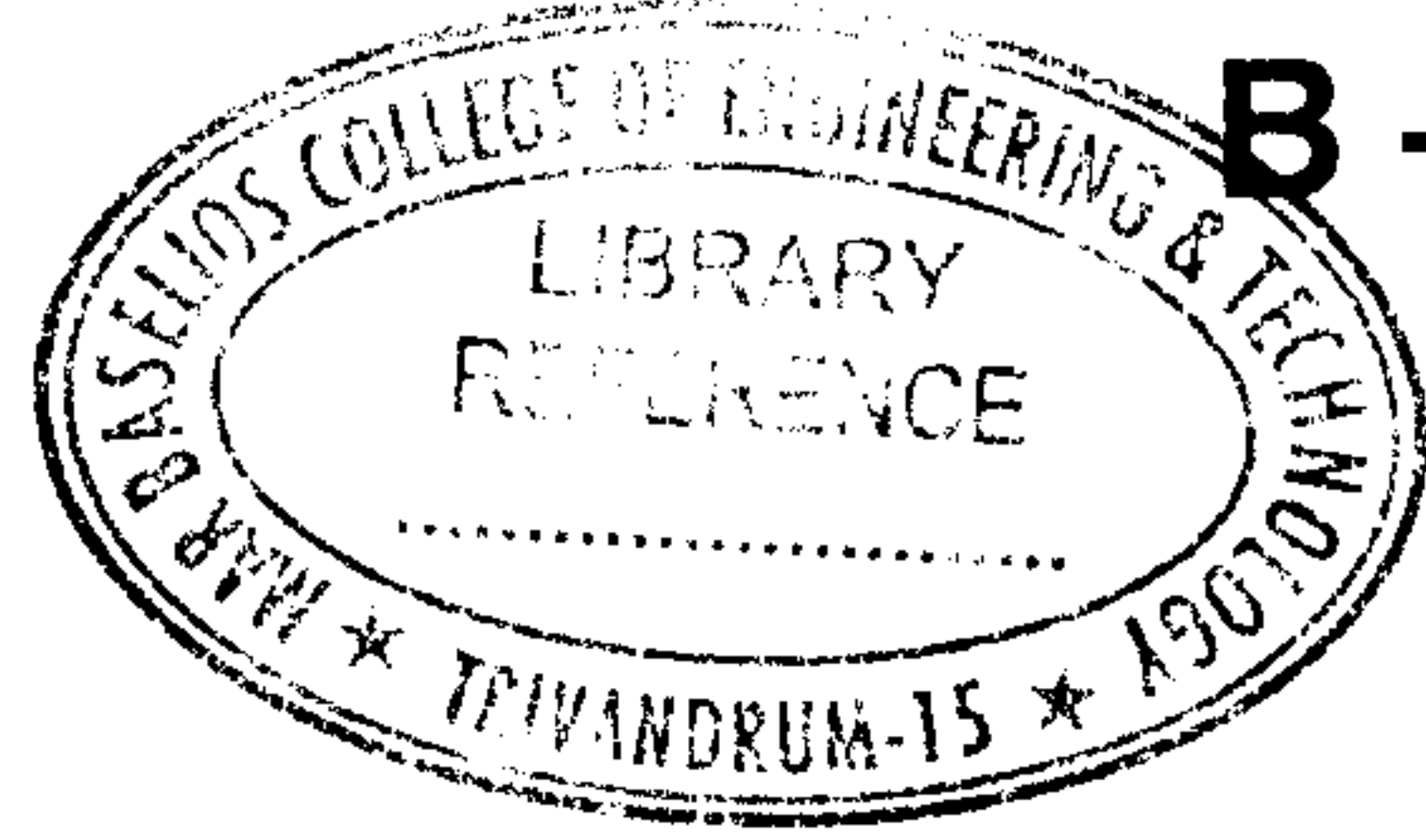




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B – 3284

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: $\oint_C \frac{e^z}{z^3(z^2 + 5z + 6)} dz$. Where C is the circle $|z - 1| = 1$.
- b) Determine the residue at the poles of $\frac{2z + 1}{(z^2 - z - 2)^2}$.
- 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: $\int_{-\infty}^{\infty} \frac{x dx}{(x^2 + 1)(x^2 + 2x + 1)}$.

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 $XX^T = 1$.

