BABU BANARASI DAS UNIVERSITY

Department of Mathematics & Computer Science

B. Tech. [II Year], First Sessional Examination, (AS: 2021-22)

Subject Code: BAS3301

(Complex Analysis and Integral Transforms)

Time 1:00Hr. **Maximum Marks 30**

SECTION 'A'

Q.N.1. Attempt all parts of the following. [5 × 1 = 5]

a. Define analytic function.

b. Write Cauchy Integral formula.

c. Show that the Function $u = x^4 - 6x^2y^2 + y^4$ is harmonic.

d. Evaluate $\int_C \frac{z}{z+1} dz$, where C is the circle $|z| = \frac{1}{2}$.

e. State Liouville's theorem.

SECTION 'B'

Q.N.2. Attempt any two parts of the following. [7.5 × 2 = 15]

a. Find analytic function $f(z)$, given that $v = e^x(x\sin y + y\cos y)$.

b. Evaluate $\int_C \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)} dz$; where C is the circle $|z| = 3$.

c. Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along the real axis from $z = 0$ to $z = 2$ and then along a line parallel to y axix from $z = 2$ to $z = 2 + i$.

d. Expand the function $f(z) = \frac{1}{z}$ about $z = 2$ in Taylors series.

SECTION 'C'

Q.N.3. Attempt any one part of the following. [10 × 1 = 10]

a. Show that the function $z|z|$ is not analytic anywhere.

b. Evaluate $\int_C \frac{z^2+1}{z^2-1} dz$; where C is the circle (i) $|z| = 3/2$, (ii) $|z - 1| = 1$.

c. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series valid for

(i) $1 < |z| < 3$ (ii) $|z| > 3$