School of Computer Science Engineering and Technology

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| Course- B. Tech | Type- Specialization Elective |
| Course Code- CSET369 | Course Name- Time Series Analysis |
| Year- 3rd Year | Semester- V |
| Date- Week 4 |  |

**Lab Assignment -4**

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| Experiment | CO1 | CO2 | CO3 |
| Convert a non-stationary time series into a stationary one using suitable transformations and analyze its autocorrelation. |  |  |  |

**Objective:** Convert a non-stationary time series into a stationary one using suitable transformations and analyze its autocorrelation.

Download the following time series dataset and read them as a python dataframe and print the heads.

* **Dataset:** Monthly Beer Production in Australia (Kaggle / standard time series datasets).

**Perform all the following tasks on the above dataset.**

**Tasks**

Task 1 — Visualization & Non-Stationarity Check

1. Load the Beer Production dataset and plot the time series.
2. Perform ADF and KPSS tests to check if the original series is stationary.

Task 2 — Apply Transformations (Techniques)

1. Apply a log transformation to stabilize variance.
2. Perform first-order differencing to remove trends.
3. Plot the transformed series at each step.
4. Re-run ADF and KPSS tests to verify stationarity.

Task 3 — Seasonal Decomposition

1. Use seasonal\_decompose (additive model) to split the beer production series into:
   * Trend
   * Seasonal
   * Residual components
2. Plot each component separately.
3. Perform a stationarity test on the residual component and interpret the result.

Task 4 — Autocorrelation Analysis (ACF/PACF)

1. Plot the ACF and PACF of the stationary (transformed) beer production series.