

PD-366-S.E.-CV-19
M.A./M.Sc. MATHEMATICS (3rd Semester)
Examination, Dec.-2020
INFORMATION THEORY-I

Time : Three Hours

[Maximum Marks : 80]

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

Section-A

1. Answer the following questions:- **1x10=10**

- (a) What is Entropy?
- (b) What is Entropy Symmetry?
- (c) Explain Recursivity?
- (d) Define joint Shannon entropy of two discrete random variables.
- (e) Find the value of $I(X, Y)$
- (f) What is mutual information? Explain.
- (g) Explain maximality.
- (h) Explain stability.
- (i) What is normalization?
- (j) What is continuity?

2. Answer the following questions:- **2x5=10**

- (a) Explain Shannon Entropy?
- (b) What is nonnegative bounded information function?
- (c) Explain expansibility.
- (d) Explain Additivety and subadditivity.
- (e) What is conditional entropy?

Section-B

12x5=60

Answer all questions.

3. Write the axiomatic characterization of the Shannon entropy due to Shannon and Fadder.

OR

State and prove the fundamental theorem of information theory.

4. What are the strong and weak converses of information theory?

OR

What are the measurable information function?

5. Explain the Axiomatic characterization of the Shannon entropy due to Tverberg and Leo.

OR

Explain Transformation and its properties.

6. Write short notes on expansibility and boundedness.

OR

Write down the interconnection between additivity, subadditivity and non negativity.

7. What are the axioms of measure of uncertainty? Explain.

OR

Write down the properties of Shannon entropy.