PD-486 CV-19

(514) M.A./M.Sc. Mathematics (Fourth Semester)

Examination June 2021

INFORMATION THEORY

Paper - VIII

Time : Three Hours] **Maximum Marks : 80**

Minimum Passing Marks :

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिये। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

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

SECTION-'A'

1. Answer the following questions: [1 X 10 = 10]

(Fill in the blanks)

(i) In "noiseless" case the probability of the event after the message is received is .....

(ii) A man is informed that, when a coin is tossed up, the result was head, The information is there in this massage is.....

(Define the followings)

(iii) Information function

(iv) Noise

(v) Continuous random variable.

(vi) Coding.

(vii) Observer.

(viii) Binary memory less channel.

(ix) Decoding

(x) Channel capacity

2. Answer the following short answer type questions :- [2 X 5 = 10]

(a) Write the general solution of the fundamental equation of information.

(b) Define band limited channels.

(c) What do you mean by data compression.

(d) Define conditional and mutual entropy.

(e) Define construction of optimal codes with example.

SECTION-'B' [12 X 5 = 60]

Long answer type questions.

3. Explain In-gradients of noiseless coding problem.

OR

Explain the role of fundamental equation of information in the study of information function.

4. State and prove the necessary and sufficient condition for the existence of instant aneous codes.

OR

Drive the general solution of the fundamental equation of information.

5. Write down the comparison between discrete channel and continuous channel in details.

OR

Explain the procedure of information processing by a channel in details.

6. Consider the discrete memoryless channel $Y = X + Z \pmod{11}$ where

$$Z = \begin{pmatrix} 1, & 2, & 3 \\ \frac{1}{3}, & \frac{1}{3}, & \frac{1}{3} \end{pmatrix}$$

And $X \in \{0, 1, 2, 3, \ldots\ldots 10\}$, Assume that Z is independent of X

(a) Find the channel capacity.

(b) What is the maximizing $p^*(x)$?

OR

State and explain Shannon capacity theorem.

7. Explain the transmission of information in band limited channel and find the fundamental for it.

OR

Write short note of the followings-

(a) Real Observer & Ideal Observer

(b) Decoding schemes with examples.