Question Paper

Exam Date & Time: 31-Jan-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATION - DECEMBER 2022
III SEMESTER B.Sc. (Applied Sciences) in Engg.
Mathematics - III [IMA 231]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1) A) How many ways are there to arrange the eleven letters in the word ICASSYSTEMS? In how many of these arrangements do the four Ss appear consecutively? How many arrangements have the E somewhere before the M and the four Ss grouped consecutively? (5)

B) How many ways are there to distribute 25 identical balls into seven distinct boxes if the first box can have no more than 10 balls but any number can go into each of the other six boxes? (5)

2) A) Suppose that X is a random variable and has a Poisson distribution with parameter α. If $3P(X=2) = 2P(X=1)$, then calculate the parameter α. Also, calculate $P(X=0)$ and $P(1 < X \leq 3)$. (5)

B) A coin is tossed till the first head appears. Let X denotes the number of tosses. Find expectation and standard deviation of X . (5)

3) A) Find "k" for the joint probability density function (4)

$$f(x,y) = \frac{-xy}{k} \; whenever \; 1 < x < 5, 0 < y < 4$$

and $f(x,y) = 0$ elsewhere. Also find $P(X+Y \leq 3)$.

B) Find the co-relation coefficient of X and Y where the joint PDF is given by (6)

$$f(x,y) = \begin{cases} x+y, & 0 \leq x,y \leq 1 \\ 0, & elsewhere. \end{cases}$$

4) A) The probability of a man hitting a target if 2/3. (a) If he fires 5 times, what is the probability of his hitting the target at most twice? (b) How many times must he fire so that the probability of his hitting the target at least once is more than 90%? (5)

B) Suppose it is known that 1% of the population suffers from a particular disease. A blood test has a 97% chance of identifying the disease for diseased individuals, but also has a 6% chance of falsely indicating that a healthy person has the disease. (5)
(i) What is the probability that a person will have a positive blood test?
(ii) If your blood test is positive, what is the chance that you have the disease?
(iii) If your blood test is negative, what is the chance that you do not have the disease?