# Practice Sheet (CO2)

## Probability and Random Processes(15B11MA301)

Q1. The CDF of a random variable X is $F_X(x) = 1 - (1 + x)e^{-x}$. Find the pdf, mean and variance of X.

Ans- $xe^{-x}, 2, 2$

Q2. The pdf of a random variable X is $f_X(x) = 0.1\, e^{-0.1\,x}, x > 0$, where X represents the power reflected from an aircraft received by a radar. If the average power is 10 W. Find the probability that the received power is greater than the average power.

Ans- 0.368

Q3. Let $X$ and $Y$ be two random variables with mean zero and unit variance. If coefficient of correlation between $X$ and $Y$ is $-0.5$, find variance of $X + 4Y$.

Ans – 13

Q4. The joint probability density function of random variables $X$ and $Y$ is given as

$$f(x,y) = \begin{cases} cx, 0 \le y \le x \le 2 \\ 0, \quad otherwise \end{cases}$$

Find (i) the value of $c$, (ii) $P(X > 1, Y < 1/2)$, (iii) $E(Y/X = 1)$,

(iv) Conditional PDF of $X$ for given $Y = 5$, if possible.

Ans: (i) 3/8, (ii) 9/32, (iii) ½, (iv) Not Defined

Q5. The p.m.f of a RV X, is given by $P(X = j) = \frac{1}{2^j}, j = 1,2,3...$ Find Characteristic function and hence the mean and variance.

Ans- $\frac{e^{it}}{2-e^{it}}$ , 2, 2

Q6. If the MGF of a discrete R.V X is given by $M_X(t) = \frac{1}{81}(1 + 2e^t)^4$, find the distribution of X.

Ans-

| X | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| $p(x)$ | $\dfrac{1}{81}$ | $\dfrac{8}{81}$ | $\dfrac{24}{81}$ | $\dfrac{32}{81}$ | $\dfrac{16}{81}$ |