**Indira Gandhi Delhi Technical University for Women**

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**Probability and Statistics (BAS-108)**

**TUTORIAL SHEET -3**

Q.1 The joint probability distribution of 2 random variables X and Y is given by: P(X=0,Y=1) = 1/3, P(X=1,Y=-1) = 1/3 and P(X=1,Y=1) = 1/3. Find (i) the marginal distributions of X and Y and (ii) the conditional probability distribution of X given Y = 1.

Q.2. Let X be a random variable with the following probability distribution

*X -3 6 9*

*P(X=x) 1/6 ½ 1/3*

Find, E(X), V(X), , V(2X+1)

Q.3 Calculate the expected value and variance of 2X and 4X + 7 where E(X) = 5 and V(X) = 2.4.

Q.4 Suppose that two-dimensional continuous random variable (X, Y) has joint pdf given by and 0 elsewhere. Verify (i) f(x,y) is a pdf. (ii) Find P(0 < X < 3/4, 1/3 < Y < 2), P(X+Y<1), P(X>Y) and P(X<1|Y<2)

Q.5 The joint distribution of X and Y is given by . Test whether X and Y are independent. Find the conditional density of X given Y=y.

Q.6. Find the moment generating function of

Q.7 Find E(X), E(X^2), Variance (X) for the following probability distribution:

| **x** | **8** | **12** | **16** | **20** | **24** |
| --- | --- | --- | --- | --- | --- |
| **p(x)** | 1/8 | 1/6 | 3/8 | 1/4 | 1/12 |

Q.8 In 4 tosses of a coin, let x be the number of heads. Calculate the expected values of x.

Q.9 If the function f(x) is defined by . For what value of c does f(x) changes to a probability density function?

Q.10. A petrol pump is supplied with petrol once a day. If its daily volume of sales (X) in thousands of litres is distributed by where 0<=x<=1, what must be the capacity of its tank in order that the probability that its supply will be exhausted in a given day shall be 0.01?

Answer key:

Soln1:

| **X** | **-1** | **0** | **1** |
| --- | --- | --- | --- |
| **p(x)** | 0 | 1/3 | 2/3 |

| **y** | **-1** | **0** | **1** |
| --- | --- | --- | --- |
| **p(y)** | 1/3 | 0 | 2/3 |

| **x** | **-1** | **0** | **1** |
| --- | --- | --- | --- |
| **P(X=x|Y=1)** | 0 | 1/2 | 1/2 |

Soln 2: E(X)=11/2, V(X)= 65/4, = 209, V(2X+1) = 65

Soln 3: E(2X) = 10, E(4X+7) = 27, V(2X) = 9.6, V(4X+7) = 38.4

Soln 4. P(0 < X < 3/4, 1/3 < Y < 2) = 3/8, P(X+Y<1) = 1/10, P(X>Y) = 3/5, P(X<1|Y<2) = 1

Soln5. f(x,y) = f(x) f(y). Thus X and Y are independent .

Soln 7: E(X) = 16, E(X^2) = 276, Var (X) = 20

Soln 8. E(X) = 2

Soln 9. c = 1

Soln10. 0.6019