N.B. :   1. **All questions are compulsory.**
         2. **Figures to the right indicate marks.**

Q.1 **Attempt any two questions out of three from the following.**

   a. One card is randomly drawn from a standard pack of 52. What is the   **(5)**
      probability that the card is -
      1. a king or a queen?   2. A diamond or a king?
      3. either a red card or an ace?

   b. Sixty percent of persons staying in a building read 'Express', fifty percent   **(5)**
      read 'Times' while thirty percent of them read both. Find the probability
      that a randomly chosen person staying in the building reads atleast one
      of the two.

   c. An electric device is made up of three independently working components **(5)**
      A, B and C. The probability of failure of the component A is 0.05, that of
      B is 0.1 and that of C is 0.2 in some fixed period of time. Find the probability
      that the device will work satisfactorily during that period of time assuming
      that it works satisfactorily when:
      1. all components are functioning
      2. atleast one component is functioning

Q.2 **Attempt Any Two questions out of three from the following.**

   a. A discrete random variable X has probability mass function given by,   **(5)**

$$P_1(x) = 0.3 \text{ when } x = -1,\ 1$$
$$= 0.4 \text{ when } x = 0$$
$$= 0 \text{ otherwise}$$

   Write   1. Probability mass function of $Y = X^2$
            2. Joint probability mass function of X and Y.
            3. Examine whether X and Y are stochastically independent.

   b. Calculate first three raw moments about origin and first three central   **(5)**
      moments for random variable X whose probability distribution function
      p(x) is given by.

x	0	1	2
p(x)	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

   c. Calculate Cov (X, Y) and ϱ between X and Y for the following.   **(5)**

X \ Y	-1	0	1
-1	0.05	0.10	0.05
0	0.10	0.40	0.10

Q.3 **Attempt Any Two questions out of Three from the following.**

a. A company that insures rings against loss estimates that 30% of its (5) costumers it insures will lose a ring during the contract period. On a certain day, five customers come for insuring their rings. Find the chance that :   1. exactly two of them
   2. None of them
   3. Majority of them shall lose their ring during the contract period

b. On an average three divorce cases are filed in a court of a small city. (5) Find the chance that on a certain day the number of such cases coming up would be :   1. One   2. at least two
   3. at most two
(Given e^{-3} = 0.04979)

c. A uniform die is thrown. Let X : number on the uppermost face of the (5) die. Write down the probability distribution function of X. Hence find expectation and variance of X.

Q.4 **Attempt Any Two questions out of Three from the following.**

a. Preet has three plain shirts, four checked shirts and two striped shirts. (5) On a certain day he chooses two of them at random one for his office dress and the other for the evening party dress. Find the probability that:
   1. both are plain   2. one plain and one checked

b. The probability mass function of a random variable X is given by, (5)

$$p(x) = \frac{1}{6} \quad \text{when } x = 0$$

$$= \frac{2}{3} \quad \text{when } x = 1$$

$$= \frac{1}{6} \quad \text{when } x = 2$$

$$= 0 \quad \text{otherwise}$$

Find: 1. $p(x = 1)$ 2. $p(x>0)$ 3. $p(x$ is even)
Also find cumulative probability distribution function f(x) for the random variable X.

c. For a Binomial variate if mean = 3 and 15. P (X = 0) = 2. P (X = 1), (5) Find P (X = 5)