Name of Course	: **B.A.(Prog.) DSE : Mathematics**
Unique Paper Code	: **62357503**
Name of Paper	: **DSC- Statistics**
Semester	: **V**
Duration	: **3 hours**
Maximum Marks	: **75 Marks**

Attempt any four questions. All questions carry equal marks.

1. An oil exploration company currently has two active projects, one in Asia and the other in Europe. Let A be the event that the Asian project is successful and B be the event that the European project is successful. Suppose that A and B are independent events with $P(A) = 0.4$ and $P(B) = 0.7$.

    i.   If the Asian project is not successful, what is the probability that the European project is also not successful?

    ii. What is the probability that at least one of the two projects will be successful?

   If A and B are two events and the probability $P(B) \neq 1$, prove that

   $$P(A|\bar{B}) = \frac{P(A) - P(A \cap B)}{1 - P(B)}$$

   Hence show that $P(A \cap B) \geq P(A) + P(B) - 1$

2. The probability density of the random variable X is given by

   $$f(x) = \begin{cases} \dfrac{x}{4}, & 0 < x \leq 2 \\ \dfrac{4}{x^3}, & 2 < x \\ 0 & elsewhere \end{cases}$$

   Find the mean, variance and cumulative distribution function of X.
   Find $P(X \leq 3)$ and $P(X > 6)$

   Three urns contain respectively 3 green and 2 white balls, 5 green and 6 white balls and 2 green and 4 white balls. One ball is drawn from each urn. Find the expected number of white balls drawn out.

3. An insurance company finds that point 0.005% of the population die from a certain kind of accident each year. What is the probability that the company must pay off on more than 3 of 10,000 insured against such accidents in a given year.

The life of electronic tubes of a certain type may be assumed to be normally distributed with mean 155 hours and standard deviation 19 hours. What is the probability
   i.   that the life of a random chosen tube is between 136 hours and 174 hours
   ii. that the life of a randomly chosen tube is less than 117 hours

[Given $\frac{1}{\sqrt{2\pi}} \int_0^1 e^{-\frac{t^2}{2}} = 0.3413$, $\frac{1}{\sqrt{2\pi}} \int_0^2 e^{-\frac{t^2}{2}} = 0.4772$]

4. Consider a sample of size 2 drawn without replacement from an urn containing three balls numbered 1, 2 and 3. let X be the smaller of the two numbers drawn and Y the larger of the two.
   i.   Find the joint discrete density function of X and Y
   ii. Find the conditional distribution of Y given $X = 1$
   iii. Find the correlation coefficient of X and Y

Calculate the coefficient of correlation for the following ages of husbands and wives

Husband's age X:	23	27	28	28	29	30	31	33	35	36
Wife's age Y:	18	20	22	27	21	29	27	29	28	29

5. Ten individuals are chosen at random from a normal population and their heights are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71 inches. Test if the sample belongs to the population whose mean height is 66 inches. [Given t at 9 degrees of freedom at 5% level of significance is 2.62]

The students of same age group from two different schools were compared for variability in their mathematical skill. A random sample of 25 pupils from one school had a variance of 16 marks while a random sample of 22 pupils from the other school had a variance of 8 marks. Examine if the difference in variability is significant. [F at (24,21) at 5% level of significance is 2.05]

6. A die is tossed 120 times and each outcome is recorded as under

Faces: 1   2   3   4   5   6
Frequency: 20 22 17 18 19 24

Is the distribution of outcomes uniform? [Given chi-square at 5 degrees of freedom at 5% level of significance is 11.07]

A sample of 900 members is found to have a mean of 3.4 cm. Can it be reasonably regarded as a simple sample from a large population with mean 3.25 cm and standard deviation 2.61 cm?