UNIVERSITY OF PETROLEUM & ENERGY STUDIES, DEHRADUN

Program	B. Tech SCS	Semester	II
Course	Mathematics II	Course Code	MATH 1005
Session	Jan-May 2018	Topic	Probability & Statistics

1. A random variable X has the following probability mass function

x	10	11	12	13	14	15	16
$P(x)$	0	k	$2k$	$2k$	$3k$	$3k^2$	$7k^2 + k$

    a. Find the value of k
    b. Find $P(10 < X < 15)$?

2. Probability density function of a continuous random variable X is given by
$$f(x) = ke^{-2|x|}, -\infty < x < \infty.$$
    a. Find k.
    b. Find the value of $P(0 \leq X < 1), P(X \geq 7)$.
    c. Find distribution function of X.

3. A function is defined by $f(x) = \begin{cases} e^{-x}, x \geq 0 \\ 0, \ x < 0. \end{cases}$
    a. Find the cumulative distribution function $F(2)$.

4. Find moment generating function of a random variable which follows (i) $B(n,p)$ (ii) $P(\mu)$ and $(iii)N(m,\sigma)$.

5. Find Mean, Variance, Skewness and Kurtosis for the following data.

x	10	11	12	13

6. A random variable X assumes the values $-1, 0, 1$ with probabilities $\frac{1}{3}, \frac{1}{2}, \frac{1}{6}$ respectively. Find the distribution function of X.

7. Find the first four moments of the following data.

Values	$15 - 25$	$30 - 40$	$45 - 55$	$55 - 75$
Frequency	15	10	20	25

Hence find Mean, Variance, Skewness and Kurtosis

8. Show that the distribution is moderately positively skewed. and curve is Mesokurtic, if first four central moments of a distribution are 0,2.5,0.7 and18.75.

9. Show that the following distribution is positively skewed

Marks Obtained	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	6	12	22	24	16	12	8

10. Show that the mean and the variance of the discrete Binormal distribution is given by np and npq respectively.

11. Solve the following problems.
   (i)In a sample of 1000 cases, the mean of a certain test is 14 and S.D. is 2.5. Assuming the distribution to be normal, find
      a. how many students score between 12 and 15?
      b. how many score above 18?
      c. how many score 16?
   (ii). Suppose a radio active source emits particle follows a Poisson distribution on average 2.5 particles per second. Calculate the probability that two or more particles will be emitted in an interval of 4 second.
   (iii). Suppose that the probability of an item being defective in a mass production process is 0.01. If 20 items are selected at random, then what is the probability that exactly 2 will be defective?