**DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES, NITK SURATHKAL**

**MA724: PROBABILITY, STATISTICS AND STOCHASTIC PROCESSES**

**ASSIGNMENT No. 1**

**Date: 16/11/2020**                                                                                   **Max. Marks: 20**
**Due Date: 23/11/2020**

# Answer ALL Questions

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1. In terms P(A), P(B), P(C), P(AB), P(BC), P (BC) and P(ABC) express, for k= 0,1,2,3 the probability that:
   (i)     Exactly k of the events A, B and C occur;
   (ii)    At least k of the events A, B, C occur

2. A secretary goes to work following one of three routes A, B, C.  Her choice of route is independent of the weather. If it rains, the probabilities of arriving late, following A, B, C are 0.06, 0.15, 0.12 respectively. The corresponding probabilities, if it does not rain, are 0.05, 0.10, 0.15 respectively. Given that on a sunny day she arrives late, what is the probability that she took route C?  Assume that on an average one in every four days is rainy.

3. The time taken X by a garage to repair a car is a continuous rv with pdf $f(x) =$
$$\begin{cases} \frac{3x}{4}(2 - x); 0 \le x \le 2 \\ \quad\quad 0 \ ; \ elsewhere \end{cases}$$
   If, on leaving his car, a motorist goes to keep on an engagement lasting for a time Y, where Y is a continuous rv independent of X, with pdf $\quad f(y) = \begin{cases} \frac{1}{2}y; 0 \le y \le 2 \\ \quad 0; \ elsewhere \end{cases}$.
   Determine the probability that the car will not be ready on his return.

4. If a continuous rv X follows a normal distribution such that P(9.6 ≤ X ≤ 13.8) = 0.7008 and P(X ≥ 9.6) = 0.8159, find the mean and variance of the distribution.

5. (i)    Prove that the mgf of the sum of two independent rvs is the product of their mgfs.
   (ii)   Calculate the mgf of a continuous rv X whose pdf is, $f(x) = \{\frac{1}{2}x^2 e^{-x}; 0 < x < \infty$
   and using the above mgf, obtain the mean and variance.

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