Jaypee Institute of Information Technology, Noida

T1 Examination, 2018

B.Tech III Semester

Course Title : Probability and Random Processes — **Maximum Time : 1 Hr.**

Course Code : 15B11MA301 — **Maximum Marks : 20**

Note: All questions are compulsory. Non-programmable calculator is allowed.

Q1: The cumulative distribution function of a random variable X is given by $F(x) = C(1 - e^{-2x^2}), x \geq 0$. Find (i) the value of C, (ii) the probability density function and (iii) $P(0 < X < 3)$. **[3]**

Q2: There are three identical cards, differ only in colour. Both sides of first card are black, both sides of the second are red, and one side of the third is black and its other side is red. These are mixed up and one of the them is selected at random. If the upper side of this card is red, what is the probability that its other side is black? **[4]**

Q3: If the moment generating function of a random variable, X is $M_X(t) = \dfrac{e^{2t} - e^t}{t}$, then find the first three central moments of it. **[4]**

Q4: If X is a Poisson random variate with $P[X = 1] = P[X = 2]$ and Y is an independent random variable having moment generation function, $M_Y(t) = \left(\dfrac{1}{3} + \dfrac{2}{3}e^t\right)^9$, then evaluate variance of random variable $(2X\text{-}3Y)$. **[4]**

Q5: The probability density function of a two dimensional random variable (X, Y) is given by $f(x, y) = kx$, $x - 1 \leq y \leq -x + 1$, $0 \leq x \leq 0.5$. Find (i) the value of k, (ii) marginal density function of X (iii) $P(Y > 0.5)$ and (iv) $E(Y^2 / X = 0.25)$. **[5]**

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