

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MAKEUP EXAMINATION- 2016

B.Tech IV Semester

COURSE CODE: 10B11MA411

MAX. MARKS: 25

COURSE NAME: PROBABILITY THEORY AND RANDOM PROCESSES

COURSE CREDITS: 04

MAX. TIME: 1 Hr 30 Min

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q(1). IF X_1, X_2 follows exponentially distributed independently with standard deviation 2. Find $P(\min(X_1, X_2) < 2)$ and $P(\max(X_1, X_2) < 2)$ and $P(X_1 + X_2 > 2)$. **4Marks**

Q(2). The Probability that a student knows the correct answer to a multiple choice question is $2/3$. If the student does not know the answer, then the student guesses the answer. The probability of the guessed answer being correct is $1/4$. Given that the student has answered the questions correctly, find the conditional probability that the student knows the correct answer. **3Marks**

Q(3). A company makes electric motors. The probability an electric motor is defective is 0.01. Using binomial distribution find the probability that a sample of 300 electric motors will contain exactly 5 defective motors. Approximate this probability using Poisson distribution and compare. **3Marks**

Q(4). An electronics system has one of each of two different types of components in joint operation. Let X and Y denote the random lengths of life of the components of type 1 and 2, respectively. Their joint density function is given by

$$f(x, y) = \frac{8x^2}{7y^3} ; 1 < x, y < 2$$

- Derive the marginal distribution function of X .
- Derive the conditional density function of X given $Y = y$
- Are X and Y independent?

3Marks

Q(5). The number of industrial injuries per working week in a particular factory is known to follow a Poisson distribution with mean 0.5. Find the probability that

- In a particular week there will be: (i) less than 2 accidents, (ii) more than 2 accidents;
- In a three week period there will be no accidents.

3Marks

Q(6).

- a. If moment generating function of random variable X is $M_X(t) = (1 - 3t)^{-1}$. Find $E(2X + 3)$
b. If $X \sim \text{Poi}(\lambda)$ and $P(X = 4) = 3 P(X = 3)$. Find λ and $P(X = 4)$.

3Marks

Q(7). Suppose that the amount of time one spends in a bank is exponentially distributed with mean 10 minutes. What is the probability that a customer will spend more than 15 minutes in the bank? What is the probability that a customer will spend more than 15 minutes in the bank given that he is still in the bank after 10 minutes?

3Marks

Q(8). Suppose that T has the exponential distribution with rate parameter λ . Find the probability density function of each of the following random variables (a) $X = T^2$, (b) $X = e^T$, (c) $X = \ln T$.

3Marks
