JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MAKE UP EXAMINATION (November 2025)

B.Tech. - III Semester (CSE/IT)

COURSE CODE (CREDITS): 18B11MA313 (3) MAX. MARKS: 25

COURSE NAME: PROBABILITY & STATISTICS

COURSE INSTRUCTORS: RKB* MAX. TIME: 1 Hr 30 Mins

***Note:*** *All questions are compulsory. Use of scientific calculator is allowed. The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.*

| Q.No | Question | CO | Marks |
|---|---|---|---|
| Q1 | A box contains 7 red, 5 white and 6 black balls. A person draws 3 balls from the box at random. Find the probability that among the balls drawn there is at least one ball of each colour. | CO-1 | 4 |
| Q2 | In a data center, three servers **A**, **B**, and **C** handle **30%**, **40%**, and **30%** of all user requests, respectively. The probabilities that a request processed by servers **A**, **B**, and **C** fails are **3%**, **2%**, and **4%**, respectively. A user request is found to have failed. What are the probabilities that this failed request was processed by **Server A**, **Server B**, and **Server C**? | CO-2 | 4 |
| Q3 | A coin has a probability of 0.6 of showing heads. The coin is tossed four times. Let X denote the number of heads obtained. Determine the probability mass function (p.m.f) of $X$ and find $P(X \leq 2)$. | CO-3 | 4 |
| Q4 | The probability density function (p.d.f.) of a continuous random variable X is given by $f(x) = \{ kx^2, 0 \leq x \leq 2; k(4-x), 2 \leq x \leq 4 ; 0, \text{otherwise} \}$.<br>(a) Find the value of $k$.<br>(b) Determine the cumulative distribution function (c.d.f.) $F(x)$. | CO-3 | 4 |
| Q5 | Suppose that the two tasks T1 and T2 run on the same server. Let $X$ and $Y$ be their *normalized execution times having the* joint pdf<br>$f(x,y) = 6xy$, for $0 < x < y < 1$.<br>Compute the probability that both tasks finish before the hard deadline at time 1; i.e., compute $P(X + Y < 1)$. | CO-3 | 4 |
| Q6 | Show that $X$ and $Y$ are independent given their joint density function as<br>$f(x,y) = \begin{cases} 3x, & 0 < x < 1, \quad 0 < y < 1 - x \\ 0, & otherwise \end{cases}$<br>Find $P(X>0.2 \mid Y=0.4)$. | CO-3 | 5 |

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