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MID TERM EXAMINATIONS – July 2024

Programme	:	B.Tech.	Semester	:	Fall Semester 2024-2025
Course Title	:	Probability, Statistics and Reliability	Course Code	:	MAT3003
Date/Session	:	15 July 2024/ Session II	Slot	:	A24+ B24+ C21+ F21+ F22
Time	:	1 ½ hours	Max. Marks	:	50

Answer all the Questions

Q. No.	Sub. Sec.	Question Description	Marks
1		Bean seeds from supplier A have an 85% germination rate, while those from supplier B have a 75% germination rate. A seed-packaging company buys 40% of its bean seeds from supplier A and 60% from supplier B, then mixes the seeds together. Determine the following: (i) P(G), the probability that a randomly selected seed from the mixed seeds will germinate. (ii) Given that a seed germinates, find the probability that it came from supplier A.	10
2	(a)	If A and B are two events with $P(A) = 0.5$, $P(B) = 0.7$, and $P(A\|B) = 0.4$, find $P(A \text{ and } B)$ and $P(A \text{ or } B)$	5
	(b)	Two cards are drawn consecutively without replacement from a standard deck of playing cards. Calculate the probability of the event of drawing a heart on the first draw and a club on the second draw.	5
3		Let the random variable X have probability function $$f(x) = \begin{cases} 2(1-x) & 0 \le x \le 1 \\ 0 & elsewhere \end{cases}$$ Sketch the graph of this pdf. Find (i) $P(0 \le x \le 1/2)$, (ii) $P(\frac{1}{4} < x < 3/4)$, (iii) $P(X = 3/4)$, and $P(X > 3/4)$	10
4		Assume a doctor expects to receive 10 patients in an hour, and each patient independently has a 0.6 probability of needing the corona vaccine. What is the probability of exactly 6 patients needing the corona vaccine in an hour? What is the probability of more than 7 patients needing the corona vaccine in an hour? What is the probability of fewer than 3 patients needing the corona vaccine in an hour?	10
5		For the given discrete probability function: $$P(X = x, Y = y) = \begin{cases} \frac{x}{12} & x = 1,2,3 \quad y = 1,2 \\ 0 & elsewhere \end{cases}$$ Obtain the marginal distribution of X and Y. Also find $E(X)$ and $E(Y)$	10

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