BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER : I**
BRANCH: QEDS **SESSION : MO/2025**

SUBJECT: ED25107 PROBABILITY I

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	If six dice are rolled, what is the probability that all show different faces?	[3]	1	1,3
Q.1(b)	If A and B are independent events, then prove that A^c and B^c are independent.	[2]	2	1,3
Q.2(a)	Throw two unbiased dice independently. Let A= {sum of the faces=8}, B= {faces are equal}. Compute **P(B|A).**	[2]	2	3
Q.2(b)	A newly constructed bridge may fall down either due to wrong designing or by inferior material used in construction. The chance that the design is faulty is 10% and the probability of its collapse if the design is faulty is 95% and that due to bad material it is 45%. If the bridge collapses. Find the probability that it was due to wrong designing.	[3]	1	2
Q.3(a)	Let X be an random variable with distribution function F, defined as $$F(x) = \begin{cases} 0, & x < 0, \\ x, & 0 \le x < 1/2, \\ 1, & x \ge 1/2. \end{cases}$$ Find $P\left\{X > \frac{1}{4}\right\}$ and $P\left\{\frac{1}{3} < X \le \frac{3}{8}\right\}$.	[2]	4	3
Q.3(b)	If X is an random variable, then prove that |X| is also an random variable.	[3]	3	1,3
Q.4(a)	If X is uniformly distributed over (0,8), calculate the probability, $P\{X < 4\}$.	[2]	4	3
Q.4(b)	It is known that any item produced by a certain machine will be defective with probability 0.2, independently of any other item. What is the probability that in a sample of three items, at most one will be defective?	[3]	5	2,3
Q.5(a)	Let X be an random variable with probability density function $$f(x) = \begin{cases} x, & 0 < x \le 1, \\ 2 - x, & 1 \le x \le 2, \\ 0, & \text{otherwise}. \end{cases}$$ Find the distribution function (DF) F of X.	[3]	4	2,3
Q.5(b)	Also, compute $P\{0.3 < X \le 1.5\}$.	[2]	4	3

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