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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	:	**16 July 2024/ Session II**	Slot	:	**A11+ D11+ A12+ D12+ A13**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		A person gets a construction job and agrees to undertake it. The completion of the job in time depends on whether there happens to be strike or not in the company. There are 40% chances that there will be a strike. Probability that job is completed in time is 30% if the strike takes place and is 70% if the strike does not take place. What is the probability that the job will be completed in time?	10
2		By examining the chest X-ray, the probability that T.B is detected when a person is actually suffering from T.B. is 0.99. The probability that the doctor diagnoses incorrectly that a person has T.B. on the basis of X-ray is 0.002. In a certain city, one in 1000 persons suffers from T.B. A person is selected at random and is diagnosed to have T.B., what is the chance that he actually has T.B.?	10
3	(a)	A random variable. X assumes the values $-2, -1, 0, 1, 2$ such that $P[X = -2] = P[X = -1] = P[X = 1] = P[X = 2], P[X < 0] = P[X = 0] = P[X > 0]$. Obtain the probability mass function of X.	5
	(b)	The p.d.f. of the different weights of a "1 litre pure ghee pack" of a company is given by: $f(x) = \begin{cases} 200(x-1) & for\ 1 \le x \le 1.1 \\ 0, & otherwise \end{cases}$ Examine whether the given p.d.f. is a valid one. If yes, find the probability that the weight of any pack will lie between 1.01 and 1.02.	5
4		In a certain factory turning out fountain pens, there is a small chance of 1/500, for any pen to be defective. The pens are supplied in packets of 10. In a consignment of 20000 packets calculate the approximate number of packets containing (i) One defective (ii) Two defective (iii) Five defective pens	10
5		The following table represents the joint probability distribution of the discrete random variable (X, Y):	10

X \ Y	1	2
1	0.1	0.2
2	0.1	0.3
3	0.2	0.1

Find:
(i) The marginal distributions.
(ii) The conditional distribution of X given $Y = 1$.
(iii) $P[(X + Y) < 4]$.