



Academic year 2023-2024 (Odd Semester 2023)

DEPARTMENT OF MATHEMATICS			
Date	08/01/24	Time	10:00 a.m. to 11:30 a.m.
TEST	I	Maximum Marks	50
Course Title	Mathematics for Artificial Intelligence & Machine Learning	Course Code	MAT231ET
Semester	III	Programs	AIML

**Instructions:** i) Answer all questions.

Sl. No.	Questions	M	C O	B T												
1a	An electronics company buys voltage stabilizers from three manufacturers A, B, C. The probability of buying a stabilizer from these manufacturers are 0.5, 0.3, 0.2 respectively. Further, the probabilities that a stabilizer made by these manufacturers works properly during a specified period of time are 0.75, 0.8 and 0.85 respectively. Determine (i) the probability that a stabilizer randomly chosen from the whole lot will work for the specified period of time, (ii) if the stabilizer works properly, find the probability that the stabilizer was manufactured by company A, by company B, by company C.	06	3	3												
1b	A discrete random variable $X$ follows the following distribution. <table><tr><td>X</td><td>1</td><td>3</td><td>5</td><td>7</td><td>9</td></tr><tr><td>P(X)</td><td>k</td><td>2k</td><td>2k</td><td>3k</td><td>k</td></tr></table> Compute (i) k, (ii) $P[1 < X \leq 7]$ .	X	1	3	5	7	9	P(X)	k	2k	2k	3k	k	04	1	2
X	1	3	5	7	9											
P(X)	k	2k	2k	3k	k											
2a	Every day, the number of network blackouts has a distribution (probability mass function) <table><tr><td>X</td><td>0</td><td>1</td><td>2</td></tr><tr><td>P(X)</td><td>0.7</td><td>0.2</td><td>0.1</td></tr></table> A small interest trading company estimates that each network blackout results in a Rs.4000 loss. Compute expectation and variance of this company's daily loss due to blackouts.	X	0	1	2	P(X)	0.7	0.2	0.1	04	2	3				
X	0	1	2													
P(X)	0.7	0.2	0.1													
2b	Obtain the mean and variance of the probability density function given. $f(x) = e^{- x }$	06	1	2												
3a	The installation time, in hours for a certain software module has a probability density function $f(x) = k(1 - x^3)$ for $0 < x < 1$ . Compute (i) k, (ii) probability that it takes less than half hour to install this module, (iii) probability that it takes more than 45 minutes to install this module.	06	2	2												
3b	The time, in minutes, it takes to reboot a certain system is a continuous variable with the density function $f(x) = \begin{cases} C(10 - x)^2, & 0 < x < 10 \\ 0, & otherwise \end{cases}$ . Find (i) C, (ii) the cumulative distribution function.	04	4	4												



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4a	After a computer virus entered the system, a computer manager checks the condition of all important files. She knows that each file has probability 0.25 to be damaged by the virus, independently of other files. Compute the probability that (i) at least 4 of the first 20 files are damaged, (ii) exactly 4 of the first 20 files are damaged, (iii) at most 4 of the first 20 files are damaged.	06	4	4
4b	In a binomial distribution consisting of 5 independent trials, probability of 1 and 2 successes are 0.2592 and 0.3456 respectively. Obtain the parameters p and q of the distribution.	04	2	3
5a	Messages arrive at an electronic message center at random times, with an average of 10 messages per hour. Compute the probability of receiving (i) more than 4 messages in the next hour, (ii) less than 6 messages in the next hour, (iii) exactly 5 messages in the next hour.	06	3	3
5b	The number of computer shutdowns during any month has a Poisson distribution, averaging 0.3 shutdowns per month. What is the probability that (i) at least 3 computers shutdowns during the next year, (ii) at most 3 computers shutdowns during the next year?	04	3	4

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks	Particulars	CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
Distribution	Test Max Marks	10	14	16	10	-	16	20	14	-	-