Hall Ticket No: | | | | | | | | | | |

Question Paper Code: 18MATP114

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year II Semester (R18) Supplementary End Semester Examinations, August - 2023

PROBABILITY & STATISTICS

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.no 1 to 5 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1(A)	(i) Define Conditional probability. State and prove multiplication rule. (ii) When a computer goes down, there is a 75% chance that it is due to an overload and a 15% chance that is due to software problem. There is an 85% chance that it is due to an overload or a software problem. What is the probability that both of these problems are at fault? What is the probability that there is a software problem but no overload?	12M	1	2
	OR			
Q.1(B)	(i) Define distribution function or cumulative distribution in discrete case and its properties. (ii) If $E(X)=3$, $E(X^2)=25$ then find (i) $E(3X-8)$ (ii) $V(X)$ (iii) $V(3X+8)$	12M	1	2
Q.2(A)	The joint density for (X, Y) is given by $f(x, y) = x y e^{-x}e^{-y}$, $x>0$, $y>0$ (i) Find the marginal densities for X and Y. (ii) Cov(X,Y) (iii) Are X and Y independent? (iv) Find P(X≤1).	12M	2	3
	OR			
Q.2(B)	(a) Let X be a random variable with density $f_x(x)=2x$, $0<x<1$. IF f (x)=Y=3x+6 then find $f_y(y)$. (b) Let X be a random variable with density $f_x(x)=\frac{1}{4}xe^{-\frac{x}{2}}$, $x\geq 0$ and let $y=-\frac{1}{2}x+2$. Find the density for y.	12M	2	3
Q.3(A)	The spontaneous flipping of a bit stored in a computer memory is called a "Soft fail". Let X denote the time in millions of hours before the first soft fail is observed. Suppose the density for X is given by $f(x)=e^{-x}$; $x>0$. Find the moment generating function, mean and variance.	12M	3	3
	OR			
Q.3(B)	Let X denote the time in hours needed to locate and correct the problem in the software that governs the timing of traffic lights in the down town area of a large city. Assume that X is normally distributed with mean 10 hours and variance 9. a) Find the probability that the next problem will require at most 15 hours to find and correct. b) The fastest 5% of repairs take at most how many hours to complete.	12M	3	3

Q.4(A) Metal conduits or hollow pipes are used in electrical wiring. In testing 1-inch pipes, these data are obtained on the outside diameter (in inches) of the pipe: 12M 4

1.281	1.288	1.292	1.289	1.291
1.293	1.293	1.291	1.289	1.288
1.287	1.291	1.290	1.286	1.289
1.286	1.295	1.296	1.291	1.286

Assume that sampling is from a normal distribution and find (i) 95% confidence interval (ii) 90% confidence interval on the mean outside diameter of pipes of this type.

OR

Q.4(B) In 1980 the Bureau of Labor Statistics conducted a study of 1000 minor eye injuries received by workers in the workplace. The study revealed that 600 of the workers involved were not wearing eye protection at the time of the injury. It also revealed that 900 of the injuries received could have been prevented through the proper use of protective eyewear. Assume that current conditions in the workplace have not changed substantially from those encountered in 1980 relative to the use of the eye protection. 12M 4 3

a) Find a 90% confidence interval on the proportion of workers who receive minor eye injuries this year that will not be wearing eye protection at the time of the injury.
b) Find a 95% confidence interval on the proportion of minor eye injuries occurring this year that could be prevented through the proper use of protective eyewear.

Q.5(A) Four doctors each test four treatments for a certain disease and observe the number of days such patient takes to recover. The results are as follows (recovery time in days): 12M 5 4

		Treatment			
		1	2	3	4
	A	10	14	19	20
	B	11	15	17	21
Doctor	C	9	12	16	19
	D	8	13	17	20

By shifting the origin to 15, discuss the difference between (i) doctors and (b) treatments.

OR

Q.5(B) The following data resulted from an experiment to compare three burners B_1, B_2 and B_3. A Latin square design was used as the tests were made on three engines and were spread over 3 days. 12M 5 5

	Engine 1	Engine 2	Engine 3
Day 1	B_1-16	B_2-17	B_3-20
Day 2	B_2-16	B_3-21	B_1-15
Day 3	B_3-15	B_1-12	B_2-13

By changing the origin to 16 for simplification in numerical computation, test the hypothesis that there is no difference between the burners.

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