Hall Ticket No: | | | | | | | | | | | Question Paper Code: 18MATP114

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year I Semester (R18) Supplementary End Semester Examinations, April - 2024

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) State and Prove Baye's theorem (ii)The blood type distributions in the United States are 41% of type A, 9% of type B, 4% of type AB and 46% of type O. It is estimated that during World War-II, 4% of inductees with type O blood were typed as A; 88% of those with type A were correctly typed; 4% with type B blood were typed as A; 10% with type AB were typed as A. A soldier was wounded and brought to surgery. He was typed as having type A blood. What is the probability that this is his true blood type?	12M	1	3
	OR			
Q.1(B)	(i) State and prove multiplication theorem. (ii)When a computer goes down, there is a 75% chance that it is due to an overload and a 15% chance that it 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
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	4
	OR			
Q.2(B)	The following data represent carbon dioxide (CO_2) emissions from coal-fired boilers (in units of 1000 tons) over a period of years between 2010 and 2016. The independent variable (year) has been standardized to yield the following table:	12M	2	4

Year (x)	1	2	3	4	5	6
CO_2 emission	910	680	520	450	370	380

(i) Estimate the linear regression equation $\mu_{Y|x} = \beta_0 + \beta_1 x$.
(ii) Estimate the average CO_2 emission from coal-fired boilers for the year 2018.

Q.3(A)	A machine fills 1000 bottles of coke in an hour. Each hour a sample of 20 bottles is randomly selected and amount of content is checked. Let X be the number of bottles selected that are underfilled. Suppose that during a particular hour 100 underfilled bottles are sampled. Find the probability that at least 3 underfilled bottles will be among those sampled.	12M	3	2

OR

Q.3(B)	Let X denote the length in minutes of a long-distance telephone conversation. The density for X is given by $f(x)=\frac{1}{10}e^{-\frac{x}{10}};\quad x>0$. Find (i) $p(X\geq 10)$ (ii) $p(5\leq X\leq 20)$ (iii) moment generating function (iv) mean (v) variance	12M	3	3
Q.4(A)	It is thought that over 60% of the business offices in the United States have a mainframe computer as part of their equipment. (a) Set up the appropriate null and alternative hypothesis for supporting this claim. (b) Find the critical point for an $\alpha = 0.05$ level test (c) When data are gathered, it is found that 233 of the 375 offices stu mainframe computers. Can H_0 be rejected at the $\alpha = 0.05$ level? To wh error are you now subject?	12M	4	3
	OR			
Q.4(B)	A low-noise transistor for use in computing products is being developed. It is claimed that the mean noise level will be below the 2.5 dB level of products currently in use. a. Set up the appropriate null and alternative hypothesis for verifying the claim. b. A sample of 16 transistors yields $\bar{x} = 1.8$ with $S = 0.8$. Do you think that H_0 should be rejected? c. Explain, in the context of this problem, what conclusion can be drawn concerning the noise level of these transistors. If you make a Type I error, what will have occurred? What is the probability that you are making such an error?	12M	4	3
Q.5(A)	In order to determine whether there is significant difference in the durability of 3 makes of computers, samples of size 5 are selected from each make and the frequency of repair during the first year of purchase is observed. The following results are observed:	12M	5	5

A	B	C
5	8	7
6	10	3
8	11	5
9	12	4
7	4	1

In view of the above data, what conclusion can you draw?

OR

Q.5(B)	What is the main objective of design of experiments? What motivated its adoption in scientific problems? State and discuss briefly three major basic principles that help in achieving the objective.	12M	5	2

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