

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year II Semester (R18) Supplementary End Semester Examinations, March - 2025**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 multiplication theorem for two events.	6M	1	2																
	(ii) Assume that in a nuclear accident 30% of the workers are exposed to LD_{50} and die; 40% of the workers die; and 68% are exposed to LD_{50} or die. What is the probability that a randomly selected worker is exposed to the LD_{50} ?	6M	1	2																
	OR																			
Q.1(B)	A drug is used to maintain a steady heart rate in patients who have suffered a mild heart attack. Let X denotes the number of heart beats per minute obtained per patient	12M	1	3																
	<table border="1" style="margin-left: auto; margin-right: auto;"><tr><td>x</td><td>40</td><td>60</td><td>68</td><td>70</td><td>72</td><td>80</td><td>100</td></tr><tr><td>f(x)</td><td>0.01</td><td>0.04</td><td>0.05</td><td>0.80</td><td>0.05</td><td>0.0</td><td>0.01</td></tr></table>	x	40	60	68	70	72	80	100	f(x)	0.01	0.04	0.05	0.80	0.05	0.0	0.01			
x	40	60	68	70	72	80	100													
f(x)	0.01	0.04	0.05	0.80	0.05	0.0	0.01													
	Find the (i) $p(68 \leq X \leq 72)$ (ii) Distribution function (iii) average heart beat of the patients (iv) variance of heart beats.																			
Q.2(A)	(i) Let X be a random variable with density $f_x(x) = 2x, 0 < x < 1$. If $f(x) = Y = 3x + 6$ then find $f_y(y)$.	6M	2	3																
	(ii) 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.	6M	2	3																
	OR																			
Q.2(B)	Let X denote the temperature ($^{\circ}C$) and let Y denote the time in minutes that it takes for the diesel engine on an automobile to get ready to start. Assume that the joint density for (X, Y) is given by $f(x, y) = c(4x + 2y + 1); 0 \leq x \leq 40, 0 \leq y \leq 2$	12M	2	4																
	(a) Find the value of c that makes this a density																			
	(b) Find the marginal densities for X and Y.																			
	(c) Find the probability that on a randomly selected day the air temperature will exceed $20^{\circ}C$.																			
	(d) Are X and Y independent?																			
Q.3(A)	Find the Moment generating function of Poisson distribution and then find mean and variance.	12M	3	3																
	OR																			
Q.3(B)	Let X be a Gamma random variable with $\alpha = 3, \beta = 4$	12M	3	3																
	(a) What is the expression for the density for X?																			
	(b) What is the Moment generating function for X?																			
	(c) Find μ, σ^2, σ																			

- Q.4(A) A new computer network is being designed. The makers claim that it is compatible with more than 99% of the equipment already in use. 12M 4 4
- (a) Set up the null and alternative hypothesis needed to get evidence to support this claim.
- (b) A sample of 300 programs is run, and 298 of these run with no changes necessary. That is, they are compatible with the new network. Can H_0 be rejected?

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. 12M 4 4
- (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?

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- Q.5(A) Three varieties of a crop are tested in a randomized block design with four replications, the layout being as given below: The yields are given in kilograms. Shifting the origin to 50, analyze for significance. 12M 5 5

C	A	B	A
48	51	52	49
A	B	C	C
47	49	52	51
B	C	A	B
49	53	49	50

OR

- Q.5(B) What do you mean by experimental group and control group? Mention three basic designs of experiment and compare any two of them. 12M 5 3

***** END*****