QP Code: RJ22MSC095 | Reg. No | | | | | | | | | | | AR 22

GIET UNIVERSITY, GUNUPUR – 765022

M. Sc. (Second Semester) Examinations, July – 2023

22MTPC204 - Mathematical Statistics (Mathematics)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A

Q.1. Answer ALL Questions **(2 x 10 =20 Marks)**

	Question	CO	Level
a.	For two events A and B, P(A) = 0.5 P(B) = 0.6 and $P(A \cup B) = 0.8$ then find $P(A/B)$ and P(B/A).	CO1	K2
b.	Derive mean and variance of discrete uniform distribution.	CO1	K2
c.	Prove that the second central moment is equal to $E(X^2) - (E(X))^2$	CO1	K2
d.	Find Maximum likelihood estimator for mean of normal distribution.	CO2	K2
e.	If X,Y are independent random variables then prove that $E[XY] = E(X)E(Y)$.	CO2	K3
f.	Define alternative hypothesis.	CO3	K1
g.	A traffic junction on an average 3 accidents per day. Then what is the probability that on a selected day there will be at least 3 accidents.	CO3	K2
h.	A sample of 100 measurements at breaking strength of cotton thread gave a mean of 7.4 and a standard deviation of 1.2 gms. Find 95% confidence limits for the mean breaking strength of cotton thread.	CO3	K2
i.	Define Type-I and Type-II errors.	CO4	K1
j.	Show that $Cov(X,Y) = E(XY) - E(X)E(Y)$.	CO4	K2

PART – B **(10 x 5 = 50 Marks)**

<u>Answer ***ANY FIVE*** the questions</u>

		Question	Marks	CO#	Blooms Level
2.	a.	State and prove Baye’s theorem.	5	CO1	K3
	b.	If two Events A and B are independent, then prove that i) A' *and* B are independent ii) A *and* B' are independent iii) A' *and* B' are independent	5	CO1	K2
3.	a.	With usual notations, prove that $E(X-K)^2 = Var(X) + [E(X) - K]^2$.	5	CO1	K2
	b.	Show that the Poisson distribution is limiting case of Binomial distribution.	5	CO1	K2
4.	a.	Derive the mean and variance of i) Hypergeometric distribution. ii) Normal distribution	10	CO2	K2
5.	a.	Let X_1 and X_2 be two independent random variables having Poisson distribution with parameters μ_1 and μ_2 respectively. Find the distribution of	10	CO2	K3

the random variable $Y_1 = X_1 + X_2$.

		Marks	CO	K
6. a.	Joint density function of the random variable X and Y is $f(x, y) = 6x$, $0 < x < 1, 0 < y < 1 - x$ a) Find marginal density functions of X and Y. b) Show that X and Y are not independent.	5	CO3	K3
b.	X_1 and X_2 be two independent random variables having joint density function $f(x_1, x_2) = 4x_1x_2 \quad 0 < x_1 < 1, \; 0 < x_2 < 1$. Find the joint distribution of $Y_1 = X_1^2 \; and \; Y_2 = X_1X_2$.	5	CO3	K3
7.a.	A random sample of 30 apples was taken from a large population. On measuring their diameter, the mean diameter of the sample was 91 millimetres with a standard deviation of 8 mm. Calculate the 95% confidence limits for the mean diameter of the whole population of apples.	5	CO4	K3
b.	In the population, the average IQ is 100 with a standard deviation of 15. A team of scientists want to test a new medication to see if it has either a positive or negative effect on intelligence, or not effect at all. A sample of 30 participants who have taken the medication has a mean of 140. Did the medication affect intelligence?(Use 0.05 Level of significance).	5	CO4	K3
8. a.	The grades of a class of 9 students on a midterm report (x) and on the final examination (y) are as follows	10	CO4	K3

x	77	50	71	72	81	94	96	99	67
y	82	66	78	34	47	85	99	99	68

Estimate the covariance

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