Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)
MAKEUP EXAMINATIONS, JULY 2022

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2252]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	A lot contains of 10 good articles, 4 with minor defects, 2 with major defects. Two articles are chosen at random. Find the probability that,(i) At least one is good. (ii) Neither has major defects. (iii) At most one is good.	**3M**
1B.	Find the mean and variance of Exponential distribution by defining its probability distribution function.	**3M**
1C.	In a normal distribution 31% of items rare under 45 and 48% are over 64. Find mean and standard deviation.	**4M**
2A.	If X and Y are two random variables having joint density function $f(x,y)=\begin{cases} k(6-x-y), & 0\le x\le 2,\ 2\le y\le 4 \\ 0, & \textit{elsewhere} \end{cases}$ Find k and P(X+Y < 3).	**3M**
2B.	Find the mean and variance of a random variable A with the pdf $f(x)=xe^{\frac{-x^2}{2}}$, X>0.	**3M**
2C.	R is a resistance to maintain a train at speed V. Find the law of the type $R=a+Vb^2$ connecting V using the following data by curve fitting method.	**4M**
3A.	A random variable X is uniformly distributed over the interval -1<x<1. Find $i)\ P\left\{X<\frac{1}{2}\right\}$ $ii)\ P\left\{\left\lvert X-\frac{1}{2}\right\rvert>\frac{1}{4}\right\}$.	**3M**
3B.	Solve using Graphical method Minimize $z=3x_1+2x_2$ subject to $5x_1+x_2\ge 10;\ x_1+x_2\ge 6;$ $x_1+4x_2\ge 12;\quad x_1,\ x_2\ge 0$	**3M**
3C.	Find the mean of the following data:	**4M**

V(miles/hour)	10	20	30	40	50
R(lb/ton)	8	10	15	21	30

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		Mid values	15	20	25	30	35	40	45	50	55	
		frequency	2	22	19	14	3	4	6	1	1	
4A.	2% of the population have a certain blood disease in serious form, 10% have in a mild form and 88% does not have it at all. A new blood test is developed. The probability that the test is positive is 0.9 if the disease in the serious form, 0.6 if in mild form, and 0.1 if no disease. A blood has tested positive. What is the probability that the blood has the serious form of the disease?										**3M**
4B.	Two independent random variable X and Y have mean 6 and 9 and variance 16 and 25 respectively. Find the correlation coefficient between U = 4X-3Y and V = X+3Y.										**3M**
4C.	If X has pdf $f(x) = \lambda e^{-\lambda(x-a)}$if $x \geq a$. Find its mgf and also find the mean and variance.										**4M**
5A.	A random variable X having Cauchy distribution. Show that $1/X$ also has Cauchy distribution.										**3M**
5B.	Suppose that X_j, j=1, 2… 50 are independent random variables each having a poison distribution with $\alpha = 0.03$. Let $S = X_1 + X_2 + \cdots + X_{50}$ using central limit theorem, evaluate Pr$\{S \geq 3\}$.										**3M**
5C.	Use simplex method to solve *Maximize* $Z = 10x + y$ *Subject to* $x + y \leq 10$ $4x + y \leq 20$ $x + 2y \leq 30$ $x, y \geq 0$										**4M**