Code No.: MA303BS	R20	H.T.No.			8	R					

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply) - December- 2025
PROBABILITY AND STATISTICS & COMPLEX VARIABLES
(MECH)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(20 Marks)**

1. a) Define Conditional Probability give one example. [2M]
b) Verify whether the function $f(x)=\begin{cases} e^{-x}, & x \geq 0 \\ 0, & x<0 \end{cases}$ is probability density function. [2M]
c) Determine the binomial distribution for which the mean is 4 and variance 3. [2M]
d) Write the formula for the probability density functions of Exponential and Normal distributions. [2M]
e) Define type –I and Type –II errors. [2M]
f) Among 900 people in a state 90 are found to be chapatti eaters. Construct 99% confidence interval for the true proportion. [2M]
g) Find the value of k if $f(x,y)=x^3+3kxy^2$ is harmonic function. [2M]
h) Find all the roots of the equation $\sin z=\cos z$. [2M]
i) Expand e^z as a Taylor's series about $z = 1$. [2M]
j) Find the fixed points of the transformation $w=\frac{2z-1}{z+2}$. [2M]

PART-B **(50 Marks)**

2.a) State and prove Baye's Theorem. [5M]
b) A bag A contains 2 white and 3 red balls and a bag B contains 4 white and 5 red balls. One bal is drawn at random from the bags it is found to be red. Find the probability that the red ball drawn is from bag B. [5M]

OR

3. a) Is $f(x)=\frac{1}{2}x^2e^{-x}$ when $x \geq 0$ can be regarded as a probability function for a continuous random variable? If, so find Mean and Variance of the random variable. [5M]
b) A random variable X has the following probability function [5M]

x	0	1	2	3	4	5	6	7
$P(X=x)$	0	K	$2K$	$2K$	$3K$	K^2	$2K^2$	$7K^2+K$

i) Find K (ii) mean of X.

4. Four Coins are tossed 160 times. The number of times x heads occure is given below. [10M]

x	0	1	2	3	4
f	8	34	69	43	6

Fit a binomial distribution to this data on the hypothesis that the coins are unbiased.

OR

5.a) In a normal distribution, 31% of items are under 45 and 8% are over 64. Find the mean and variance of the distribution. [5M]

b) Show that the mean and variance of a Poisson distribution are equal. [5M]

6. Two independent samples of 8 and 7 items respectively had weights in ounces as given below. Is the difference between means of the sample significant? [10M]

Sample-1	9	11	13	11	15	9	12	14
sample-2	10	12	10	14	9	8	10	--

OR

7. In a city A 20% of a random sample of 900 school boys had a certain physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? [10M]

8. Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\left|\text{Re}\, alf(z)\right|^2 = 2\left|f'(z)\right|^2$ where $W = f(z)$ is analytic function. [10M]

OR

9.a) If $u = e^x\left[\left(x^2-y^2\right)\cos y - 2xy\sin y\right]$ is real part of an analytic function, find the analytic function. [5M]

b) If u is harmonic function, show that $w = u^2$ is not a harmonic. [5M]

10.a) Verify Cauchy's theorem for the function $f(z) = 3z^2 + iz - 4$ if C is the square with vertices $1 \pm i$ and $-1 \pm i$. [5M]

b) Evaluate $\int (2y + x^2)\,dx + (3x - y)dy$ along the parabola $x = 2t, y = t^2 + 3$ from the point (0,3) to the point (2,4). [5M]

OR

11. Find the Laurent's series expansion for $f(z) = \frac{z+3}{z(z-2)(z-1)}$ in the region (i)$|\,z\,| < 1$ (ii) $1 < |\,z\,| < 2$ (iii) $|\,z\,| > 2$. [10M]

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