

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--

R23

KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR

23ME28BS301

II B. Tech I Semester Supplementary Examinations, JUNE-2025.

PROBABILITY, STATISTICS & COMPLEX VARIABLES

(ME)

Time: 3 Hours

Max. Marks: 60

Note: Question paper consists of Part-A & Part-B.

i) **Part-A** for 10M, ii) **Part-B** for 50marks

- Part A** is compulsory, consists of 10 sub questions from all units carrying equal marks.
- Part-B** consists of **10 questions** (numbered from 2 to 11) carrying **10marks** each. From each unit there are 2 questions and the students should answer one of them. Hence the student should answer **5 questions** from **Part-B**.

3 questions from Part-B.

PART-A		(10Marks)																			
Q. No	Questions	Marks	BTL																		
1.a)	Define discrete and continuous random variable.	1	1																		
1.b)	If $P(A) = 7/13$, $P(B) = 9/13$ and $P(A \cap B) = 4/13$ evaluate $P(A/B)$.	1	2																		
1.c)	A fair coin is tossed six times. Find the probability of getting four heads.	1	2																		
1.d)	Define Poisson distribution	1	1																		
1.e)	Define Type-I and Type-II Error in hypothesis.	1	1																		
1.f)	If we can assert with 95% that the maximum error is 0.05 and $P = 0.2$, find the size of sample.	1	2																		
1.g)	Show that the function $u(x,y) = e^x \cos y$ is harmonic.	1	1																		
1.h)	Find the Singular points of $f(z) = \frac{1}{z^2 - 5z + 6}$	1	2																		
1.i)	State Cauchy's Residue theorem.	1	1																		
1.j)	Determine the poles of the function $f(z) = \cot z$	1	2																		
PART-B		(50Marks)																			
Q.No.	Questions	Marks	BTL																		
2. a)	A random variable X has the following probability distribution <table> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>$p(x)$</td> <td>0</td> <td>k</td> <td>$2k$</td> <td>$2k$</td> <td>$3k$</td> <td>k^2</td> <td>$2k^2$</td> <td>$7k^2 + k$</td> </tr> </table> Find i) k ii) Mean iii) Variance	x	0	1	2	3	4	5	6	7	$p(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$	5M	3
x	0	1	2	3	4	5	6	7													
$p(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$													
b)	A bag A contains 2 white and 3 red balls and a bag B contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that the red ball drawn is from bag B.	5M	3																		
OR																					
3. a)	Three machines I, II, III produce 40%, 30%, 30% of the	5M	4																		

	total number of items of factory. The percentages of defective items of these machines are 4%, 2%, 3%. If an item is selected at random, find the probability that the item is defective.		
b)	A continuous random variable has the probability density function $f(x) = \begin{cases} k x e^{-\lambda x}, & \text{for } x \geq 0, \lambda > 0 \\ 0, & \text{otherwise} \end{cases}$ Determine (i) k (ii) Mean (iii) Variance	5M	3
4. a)	The mean of Binomial distribution is 3 and the variance is $\frac{9}{4}$. Find (i) the value of n (ii) $P(X \geq 7)$ (iii) $P(1 \leq X < 6)$	5M	2
b)	The mean and standard deviation of the marks obtained by 1000 students in an examination are respectively 34.5 and 16.5. Assuming the normality of the distribution, find the approximate number of students expected to obtain marks between 30 and 60.	5M	4
OR			
5. a)	The average number of phone calls/minute coming into a switch board between 2 p.m and 4 p.m is 2.5. Determine the probability that during one particular minute there will be (i) 4 or fewer (ii) more than 6 calls.	5M	3
b)	In a Normal distribution, 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution.	5M	4
6. a)	The mean and standard deviation of a population are 11,795 and 14,054 respectively. What can one assert with 95% confidence about the maximum error if $\bar{x} = 11,795$ and $n = 50$. And also construct 95% confidence interval for the true mean.	5M	3
b)	Two types of new cars produced in U.S.A are tested for petrol mileage, one sample is consisting of 42 cars averaged 15 kmpl while the other sample consisting of 80 cars averaged 11.5 kmpl with population variances as $\sigma_1^2 = 2$ and $\sigma_2^2 = 1.5$ respectively. Test whether there is any significance difference in the petrol consumption of these two types of cars. (use $\alpha = 0.01$)	5M	3
OR			
7. a)	A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not upto the standard.	5M	4
b)	In a sample of 1000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance?	5M	3

8.	Show that the function $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} \quad z \neq 0$ $= 0, \quad z = 0$ is continuous and the Cauchy-Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist.	10M	4
OR			
9. a)	Show that $f(z) = \sin z$ is analytic everywhere in the complex plane and find $f'(z)$.	5M	4
b)	Verify that $u = x^2 - y^2 - y$ is harmonic in the whole complex plane and find a conjugate harmonic function v of u .	5M	3
OR			
10.a)	Evaluate $\int_c (x - 2y)dx + (y^2 - x^2) dy$ where c is the boundary of the first quadrant of the circle $x^2 + y^2 = 4$	5M	3
b)	Evaluate $\int_c \frac{z+4}{z^2+2z+5} dz$ where c is $ z + 1 - i = 2$ using Cauchy's integral formula.	5M	4
OR			
11.a)	Expand the Laurent series of $\frac{z^2-1}{(z+2)(z+3)}$ for $ z > 3$	5M	4
b)	Find the poles of the function $\frac{z+1}{z^2(z-2)}$ and the residues at these poles.	5M	2

—ooOoo—