

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

II B.Tech II Semester Regular/Supplementary Examinations, May - 2024

**COMPLEX VARIABLES AND STATISTICAL METHODS
(Common to CE and ME)**

Time: 3 hours

Max. Marks: 70

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	a) Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log f(z) = 0$ where $w = f(z)$ is analytic function.	K3	CO1	7M
	b) Obtain the imaginary part whose real part is $e^x (x \cos y - y \sin y)$.	K3	CO1	7M
OR				
2.	If $f(z) = \frac{x^3 y(y-ix)}{x^6 + y^2}$, $z \neq 0$ prove that $\frac{f(z)-f(0)}{z} \rightarrow 0$ as $z \rightarrow 0$ along any radius vector but not as $z \rightarrow 0$ along the curve $y = ax^3$.	K3	CO1	14M
UNIT – II				
3.	a) Expand $f(z) = \frac{1}{z^2 - z - 6}$ about (i) $z = -i$ (ii) $z = 1$.	K3	CO2	7M
	b) Expand $f(z) = \frac{e^{2z}}{(z-1)^2}$ about $z = 1$ as Laurent's series. Also obtain the region of convergence.	K3	CO2	7M
OR				
4.	a) Evaluate $\int_C \frac{z}{(z-1)(z-2)^2} dz$ where C is the circle $ z-2 = \frac{1}{2}$ using Residue theorem.	K3	CO2	7M
	b) Evaluate $\int_C \frac{e^z}{(z^2 + \pi^2)} dz$ where C is $ z =4$.	K3	CO2	7M
UNIT – III				
5.	a) Given that $p(x) = (K/2) x$, is a probability distribution for a random variable X that can take on the values $x = 0, 1, 2, 3$ and 4 . (i) Determine K (ii) Determine mean and variance of X .	K3	CO3	7M
	b) The probability density function $f(x)$ of a continuous random variable is given by $f(x) = \begin{cases} kx^3, & \text{for } 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$ Obtain the value of k and the probability that the random variable takes on a value (i) between $\frac{1}{4}$ and $\frac{3}{4}$ (ii) greater than $\frac{2}{3}$	K3	CO3	7M
OR				
6.	a) Assume that 50% of all engineering student are good in Mathematics. Determine the probabilities that among 18 engineering students (i) exactly 10 (ii) at least 10 (iii) at most 8 (iv) at least 2 and at most 9 are good in mathematics.	K3	CO3	7M

	b)	If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs, how many students have masses (i) greater than 72kgs (ii) less than or equal to 64 kgs (iii) between 65 and 71 kgs.	K3	CO3	7M
UNIT – IV					
7.		A population consists of six numbers 4, 8, 12, 16, 20, 24. Consider all possible samples of size two which can be drawn without replacement from the population. Obtain (a) The mean of the population (b) The standard deviation of the population (c) The mean of the sampling distribution of means and (d) The standard deviation of sampling distribution of means	K3	CO4	14M
OR					
8.	a)	A random sample of size is taken from a normal population with $\mu = 51.4$ and $\sigma = 6.8$. What is the probability that the mean of the sample will (i) exceed 52.9 (ii) fall between 50.5 and 52.3 (iii) be less than 50.6.	K3	CO4	7M
	b)	The efficiency expert of a computer company tested 40 engineers to estimate the average time it takes to assemble a certain computer component, getting a mean of 12.73 minutes and S.D of 2.06 minutes. (i) If $\bar{X} = 12.73$ is used as a point estimate of the actual average time required to perform the task, determine the maximum error with 99% confidence. (ii) Construct 98% confidence intervals for the true average time it takes to do the job. (iii) With what confidence can we assert that the sample mean does not differ from the true mean by more than 30 seconds?	K3	CO4	7M
UNIT – V					
9.	a)	A manufacture claimed that at least 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample 200 pieces of equipment revealed that 18 were faulty. Test his claim at 5% level of significance.	K3	CO5	7M
	b)	In two samples of women from Punjab and Tamilnadu, the mean height of 1000 and 2000 women are 67.6 and 68.0 inches respectively. If the population standard deviation of Punjab and Tamilnadu are same and equal to 5.5 inches then, can the mean heights of Punjab and Tamilnadu women be regarded as same at 1% level of significance?	K3	CO5	7M
OR					
10.	a)	It is claimed that a random sample of 49 tyres has a mean life of 15200 km. This sample was drawn from a population whose mean is 15150 kms and a standard deviation of 1200 kms. Test the significance at 0.05 level.	K3	CO5	7M
	b)	A manufacturer of electronic equipment subjects samples of two completing brands of transistors to an accelerated performance test. If 45 of 180 transistors of the first kind and 34 of 120 transistors of the second kind fail the test, what can he conclude at the level of significance 5% about the difference between the corresponding sample proportion?	K3	CO5	7M