Code No: R2022011 **R20** **SET - 1**

II B. Tech II Semester Supplementary Examinations, December– 2023

COMPLEX VARIABLES AND STATISTICAL METHODS

(Common to CE, ME, AME & MM)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit

All Questions carry **Equal** Marks

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UNIT-I

1 a) Show that $\bar{z}$ is not differentiable at origin. [7M]

b) Determine analytic function whose real part is $u = \frac{Sin2x}{Cosh2y - Cos2x}$ [7M]

Or

2 a) Show that $u(x, y) = e^{-2xy}\sin(x^2 - y^2)$ is harmonic, find its conjugate. [7M]

b) Evaluate $\int_0^{1+i}(x^2 + iy)dz$ along the paths (i) y = x [7M]

UNIT-II

3 a) Obtain the Taylor's series expansion $f(z) = \frac{e^z}{z(z+1)}$ about z = 2 [7M]

b) Using Residue theorem Evaluate $\int_c \frac{dz}{z^3(z+4)}$ Where C is the circle |z +2|= 3. [7M]

Or

4 a) Find the Laurent's expansion f(z) = $\frac{1}{z^2-4z+3}$ for 1< |z| < 3 [7M]

b) Evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5+4\cos\theta} d\theta$ using Residue theorem. [7M]

UNIT-III

5 a) A random variable x has the following probability function: [7M]

x	: 0	1	2	3	4	5	6	7
P(x)	: 0	k	2k	2k	3k	k^2	$2k^2$	$7k^2$ +k

(i) Find the value of k (ii) if P(X≤ k) > ½ , find minimum value of k

b) In a normal distribution 31% of the items are under 45 and 11% of the items are over 65. Find the mean and variance of the distribution. [7M]

Or

6 a) For the distribution $f(x) = x^2,\ 0 \le x \le 1$ and if $P(a < x < 1) = \frac{19}{81}$ find the value of 'a'. [7M]

b) Companies A, B and C produce 30%, 50% and 20% of the buses respectively. It is known that 3%, 4%, 2% of the buses produced from A, B and C are defective. If a bus purchased is found to be defective what is the probability that this bus is produced by company B or C? [7M]

UNIT-IV

7 a) A random sample of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval. [7M]

b) Show that the sample variance is an unbiased estimator of population variance. [7M]

Or

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8 A population consists of six numbers {4, 8, 12,16,20,24 }consider all samples of size two. Which can be drawn without placement from this population? Find [14M]

(i) The mean of the population
(ii) Standard deviation of the population
(iii) The mean of sampling distribution of means
(iv) The standard deviation of the sampling distributions of means

UNIT-V

9 a) In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes. Can we reject the null hypothesis $\mu = 32.6$ minutes in favour of alternative null hypothesis $\mu > 32.6$ at 1% level of significance. [7M]

b) A machine A produced 20 defective articles in a batch of 400 and machine B produced 10 defective in a batch of 300. Have two machines produced capacity is same, test at 5% level. [7M]

Or

10 a) Experience had shown that 20% of a manufactured product is of the top quality. In one day's production of 400 articles only 50 are of top quality. Test the hypothesis at 0.05 level of significance. [7M]

b) A certain medicine is given to each of the 9 patients resulted following: 7, 3, -1, 4, -3, 5 , 6, -4, -1. Can it be conclude that the medicine will general be accompanied by an increase of blood pressure test at 5% level. Assume mean blood pressure is zero. [7M]

Note: Statistical tables are required.