Code No: R1922031 **R19** SET - 1

II B. Tech II Semester Regular Examinations, August/September - 2021
COMPLEX VARIABLES & STATISTICAL METHODS
(Mechanical Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1 a) Show that $f(z)=\begin{cases}\dfrac{x^2y^5(x+iy)}{x^4+y^{10}}, & z\neq 0\\ 0, & z=0\end{cases}$ is not analytic at $z=0$, although the Cauchy-Riemann equations are satisfied at the origin. (8M)

b) Find the analytic function $f(z)=u+iv$ where $u=e^x\cos y$. (7M)

Or

2 a) Integrate $f(z)=x^2+ixy$ from $A(1,1)$ to $B(2,8)$ along the curve $x=t$, $y=t^3$. (8M)

b) Use Cauchy's integral formula to evaluate $\oint_C \frac{e^{2z}}{(z-1)(z-2)}dz$ where C is the circle $|z|=3$. (7M)

3 a) Find Taylor's expansion of $f(z)=\frac{2z^3+1}{z^2+z}$ about the point $z=i$. (8M)

b) Find the Laurent series of $f(z)=\frac{7z-2}{(z+1)z(z-2)}$ in the region $1<|z+1|<3$. (7M)

Or

4 a) Determine the poles of the function $f(z)=\frac{z^2}{(z-1)^2(z+2)}$ and the residue at each pole. (8M)

b) Use residue theorem to evaluate $\int_{-\infty}^{\infty}\frac{x^2}{(x^2+1)(x^2+4)}dx$. (7M)

5 a) In a Certain City, 40 percent of the people consider themselves Conservatives, 35 percent consider themselves to be Liberals, and 25 percent consider themselves to be Independents. During a Particular election, 45 Percent of Conservatives voted, 40 percent of the Liberals voted and 60 percent of the Independents are voted. If a randomly selected person voted, find the probability that the voter is Conservative? (8M)

b) A discrete random variable X has the following probability distribution (7M)

Value of X	0	1	2	3	4	5	6
$P(X=x)$	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$

(i) Find the value of 'k'. (ii) Find $P(X<4), P(3<X\le 6)$ *and* $P(X\ge 5)$
(iii) Find the distribution function of X.

Or
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6 a) Find the mean and variance of the Poisson distribution. (8M)

b) Calculate the mean and S.D of a normal distribution in which 31% are under 45 and 8% are over 64. (7M)

7 a) Define Population and sample with examples. (8M)

b) Explain Point and Interval estimations. (7M)

Or

8 a) Determine a 95% confidence interval for the mean of a normal distribution with variance $\sigma^2 = 0.25$, using a sample of $n = 100$ values with mean $\bar{x} = 212.3$. (8M)

b) Explain *t*-distribution. (7M)

9 a) Explain the test procedure for small sample test concerning mean.

b) In a random sample of 100 tube lights produced by company A, the mean life time of tube light is 1190 hours with standard deviation of 90 hours. Also in a random sample of 75 tube lights from company B the mean life time is 1230 hours with standard deviation of 120 hours. Is there a difference between the mean lifetimes of the two brands of tube lights at a significance level of 0.05? (8M)

Or (7M)

10 a) In a study to estimate the proportion of residents in a certain city and its suburbs who favor the construction of a nuclear power plant, it is found that 63 of 100 urban residents favor the construction while only 59 of 125 suburban residents are in favor. Is there a significant difference between the proportion of urban and suburban residents who favor construction of the nuclear plant? Use a 0.05 level of significance. (8M)

b) The mean life of 10 electric motors was found to be 1450 hrs with a S.D. of 423 hrs. A second sample of 17 motors chosen from a different batch showed a mean life of 1280 hrs with a S.D. of 398 hrs. Is there a significant difference between the means of the two samples? Use a 0.01 level of significance. (7M)

Note : - Statistical tables are required