COLLEGE OF ENGINEERING ,PUNE
DEPRTMENT OF MATHEMATICS

Class: S.Y.B.Tech(Elec) **MA222** **MAX. MARKS:25**

END SEMESTER EXAMINATION **Time:**

N.B. 1. Read the instructions carefully.
2. Use of non-programmable calculators are allowed.
3. Answer Each Section SEPERATELY.

SECTION I

Q.1)A Define unbiased estimator and show that S^2 is an unbiased estimator of the parameter σ^2. 03

B Many cardiac patients were implemented pacemakers to control their heartbeat. A plastic connector module mounts on the top of the pacemaker. Assuming a std. dev. Of 0.0015 and an approximate normal distribution; (1) Find a 95% confidence interval for the mean of all connector modules made by a certain manufacturing company. A random sample of 75 modules has an avg. of 0.310 inch. (2) How large a sample is needed in above example if we wish to be 95% confidence that our sample mean will be within 0.0005 inch of the true mean. 04

B

OR

A machine is producing metal piece that are cylindrical in shape. A sample of piece is taken and the diameters are 1.01,0.97,1.03,1.04,0.89,0.98,0.99,1.01 and 1.03 cm. Find a 99% confidence interval for the mean diameter of piece from this machine, assuming an approximate normal distribution.

C A manufacturer of car batteries claims that his batteries will last on average 3 years with a variance of 1 year. If 5 of these batteries have lifetimes of 1.9, 2.4, 3.0, 3.5 & 4.2 years, construct a 90% confidence interval for σ^2 and decide if the manufacturer's claim that $\sigma^2 = 1$ is valid. Assume the population of battery lives to be approximately normally distributed. 04

Q. II

1. State and prove converse of Cauchy integral formula. **[2]**
2. Evaluate $\int_c \frac{e^{2z}}{(z-1)(z-2)}dz$ Where $c : |z| = 2$. **[2]**
3. Find all possible Laurent series expansion of $\frac{7z^2+9z-18}{z^2-9z}$ about $z = 0,\ z = 3$. **[4]**
4. Using residue theorem evaluate: $\int_c \frac{z^2}{(z-1)^2(z-2)}dz$. Where $c : |z| = 3$ **[3]**
5. . Using complex veriable techniques evaluate $\int_0^{2\pi} \frac{\sin^2\theta - 2\cos\theta}{2+\cos\theta}d\theta$ **[3]**

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