14MA401

Hall Ticket Number:

II/IV B.Tech (Regular / Supplementary Repeat Exam) DEGREE EXAMINATION

January, 2021 **Common to all branches**

Fourth Semester **Engineering Mathematics-IV**

Time: Three Hours **Maximum:** 60 Marks

Answer All Questions from Part - A (1X12 = 12 Marks)
Answer ANY FOUR questions from Part - B (4X12=48 Marks)

Part - A

1. Answer all questions (1X12=12 Marks)

a) Find the imaginary part of log (-i)

b) State Cauchy-Rieman equations in Cartesian form

c) Evaluate $\int_0^{1+i} z^2 dz$

d) Write the formula Cauchy's Internal formula

e) Evaluate $\int_c \frac{dz}{z-2}$ where 'c' is the circle $|z-2| = 1$

f) Find the poles of $\frac{1}{z^2-1}$

g) Find the value of finite population correction factor of n=100 and N=1000

h) What is the mean and variance of Binomial distribution

i) Define maximum error of estimate for small samples

j) Define Type I error and Type II error

k) Define F- distribution

l) an assert with 95% that the maximum error is 0.05 and p= 0.2, find the size of the sample

Part - B

2. a) If w=logz find $\frac{dw}{dz}$ and determine where w is non analytic 6M

b) Show that $u = e^{-x}(xsiny - ycosy)$ is harmonic 6M

3. a) Evaluate $\int_0^{1+i}(x^2 - iy)dz$ along the path (i)y=x (ii) y=x^2 6M

b) Evaluate $\int \frac{sin^2 z}{(z-\frac{\pi}{6})^3} dz$, if c is the circle $|z| = 1$ 6M

4. a) Obtain the Taylor series to represent the function $\frac{z^2-1}{(z+2)(z+3)}$ in the region $|z| < 2$ 6M

b) Obtain the Laurent series of the function $\frac{7z-2}{(z+1)z(z-2)}$ about $z_0 = -1$ 6M

5. a) Find the poles and residues at each pole $\frac{ze^z}{(z-1)^3}$ 6M

b) Use the method of contour integration to evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+a^2)^3} dx$ 6M

P.T.O.

6. a) If the probability of a random variable is given by $f(x) = \begin{Bmatrix} kx^2 & 0 < x < 1 \\ 0 & elsewhere \end{Bmatrix}$ 6M

Find the value k and probability that the random variable takes on a value

(a) Between $\frac{1}{4}$ and $\frac{3}{4}$ (b) greater than $\frac{2}{3}$

b) Find the probability that a random variable having the standard normal distribution will take as value 6M

(a) Between 0.87 and 1.28 (b)between -0.34 and 0.62

(c) greater than 0.85 (d) greater than -0.65

7. a) If a 1-gallon can a paint covers on the average 513.3 square feet with a standard deviation of 31.5 square feet, what is probability that the sample mean covered by a sample of 40 of these 1-gallon cans will be anywhere from 510.0 to 520.0 square feet 6M

b) The chi-square distribution with 4 degrees of freedom is given $f(x) = \begin{Bmatrix} \frac{1}{4}xe^{-\frac{x}{2}} & x > 0 \\ 0 & x \leq 0 \end{Bmatrix}$ find the probability that a variance of a random sample of size 5 from a normal population with $\sigma = 12\ will\ exceed\ 180$ 6M

8. a) A random sample of size n=100 is taken from a population with $\sigma = 5.1$. Given that the sample mean is $\bar{x} = 21.6$ construct a 95% confidence interval for the population mean u. 6M

b) A research worker wants to determine the average time it takes a mechanic to rotate the tires of a car and she wants to be able to assert with 95% confidence that the mean of her sample is off by atmost 0.50 minute. If she resume from past experience that $\sigma = 1.6$ minutes, how large a sample will she have to take 6M

9. a) A company claims that its light bulbs are superior to those of its competitor. If a study showed that to sample of n_1=40 of its bulbs has a mean lifetime of 1647 hours of continuous use with a standard deviation of 27 hours. While a sample of n_2=40 bulbs made by its main competitor has a mean life time of 1638 hours of continuous. Does this substantiate the claim at the 0.05 level of significance. 6M

b) Experience has shown that 20% of a manufactured product as 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. 6M