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II/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION**April, 2017****Common for all branches****Fourth Semester****Engineering Mathematics -IV****Time:** Three Hours**Maximum : 60 Marks***Answer Question No.1 compulsorily.*

(1X12 = 12 Marks)

Answer ONE question from each unit.

(4X12=48 Marks)

1 Answer all questions

(1X12=12 Marks)

- Find the imaginary part of $\log(-i)$.
- State Cauchy-Riemann equations in polar form.
- Evaluate $\int_C \frac{dz}{z-2}$, where 'C' is the circle $|z-2|=1$.
- If $z=a$ is simple pole of $f(z)$, then what is residue of $f(z)$ at $z=a$?
- Find the nature of singularity of $f(z) = \frac{z-\sin z}{z^2}$.
- State Residue theorem.

- g) If the distribution function of a random variable is given by $F(x) = \begin{cases} 1 - \frac{1}{x^2}; & x > 1 \\ 0 & ; \quad x \leq 1 \end{cases}$,

Find the probability that this random variable will take on a value less than 3.

- What is the mean and standard deviation of standard normal distribution?
- The variance of a population is 2. The size of the sample collected from the population is 169. What is the standard error of mean?
- What are the errors of sampling?
- Define point estimation.
- Define F-distribution.

UNIT I

- 2 a) Find all roots of the equations (i) $\sqrt[3]{1+i}$ (ii) $z^2 + z + 1 = i$. 6M

- b) Evaluate $\int_C \frac{z-1}{(z+1)^2(z-2)} dz$, using Cauchy's integral formula, where 'C' is $|z-i|=2$. 6M

(OR)

- 3 a) Show that $u = e^{-x}(x \sin y - y \cos y)$ is harmonic and find its conjugate harmonic. 6M

- b) If $F(a) = \int_C \frac{4z^2 + z + 5}{z-a} dz$, where 'C' is the ellipse $\left(\frac{x}{2}\right)^2 + \left(\frac{y}{3}\right)^2 = 1$ then find the value of (i) $F(3.5)$ (ii) $F(i)$, $F^1(-1)$, $F^{11}(-i)$. 6M

UNIT II

- 4 a) Expand $f(z) = \cos z$ in powers of ' $z - \pi/2$ '. 6M

- b) Using the method of contour integration prove that $\int_{-\infty}^{\infty} \frac{dx}{x^4 + 1} = \frac{\pi}{\sqrt{2}}$ 6M

(OR)

- 5 a) Evaluate $\int_C \frac{z \cos z}{\left(z - \frac{\pi}{2}\right)^3} dz$ where 'C' is the circle $|z-1|=1$, by using Cauchy's Residue theorem. 6M

- b) Expand $f(z) = \frac{1}{(z-1)(z-2)}$ in the region (i) $|z| < 1$ (ii) $1 < |z| < 2$ (iii) $|z| > 2$. 6M

UNIT III

- 6 a) If 20% of the memory chips made in a certain plant are defective, what are the probabilities that in a lot of 100 randomly chosen for inspection using normal approximation to binomial distribution (a) at most 15 will be defective; (b) exactly 15 will be defective? 6M
- b) If the mean of breaking strength of copper wire is 575 lbs with a standard deviation 8.3 lbs. How large a sample must be used in order that there will be one chance in 100 that the mean breaking strength of the sample is less than 572 lbs. 6M

(OR)

- 7 a) If the joint probability density of two random variables is given by

$$f(x_1, x_2) = \begin{cases} 6 e^{-2x_1 - 3x_2} & \text{for } x_1 > 0, x_2 > 0 \\ 0 & \text{elsewhere} \end{cases}$$

- (i) Find the probability that the first random variable will take on a value between '1' and '2' and the second random variable will take on a value between '2' and '3'
- (ii) Find the probability that the first random variable will take on a value less than '2' and the second random variable will take on a value greater than '2'. 6M
- b) The chi square distribution with 4 degrees of freedom is given by
- $$f(x) = \begin{cases} \frac{1}{4} x e^{-x/2}; & \text{for } x > 0 \\ 0; & \text{for } x \leq 0 \end{cases}$$
- Find the probability that the variance of a random sample of size 5 from a normal population with $\sigma = 12$ will exceed 180. 6M

UNIT IV

- 8 a) An airline claims that only 6% of all lost luggage is never found. If, in a random sample, 17 of 200 pieces of lost luggage are not found, test the null hypothesis $p = 0.06$ against the alternative hypothesis $p > 0.06$ at the 0.05 level of significance. 6M
- b) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population. 6M

(OR)

- 9 a) Experience has 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. 6M
- b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs.487 with a standard deviation Rs.48. With what degree of confidence can assert that the average weekly salary of all teachers in the metropolitan area is between Rs.472 to Rs.500 6M