AR13

PART-A

ANSWER ALL QUESTIONS   **[10 x 1 = 10 M]**

1. a) Define Analytic function
    b) Write Cauchy-Reimann equations in polar coordinates
    c) Define Essential Singularity
    d) Compute the residue at the singularity of the function $R(z) = \dfrac{1-z}{1-2z}$
    e) Define cross ratio
    f) Define fixed points of the transformation
    g) Write any two properties of Moment generating function
    h) We have drawn two cards from a given deck of 52 cards that too without replacement. Find the probability that both are kings
    i) Define Type-I and Type-II Errors
    j) What is the test statistic used for calculating test of hypothesis of two samples means coming from same population

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2.
   a) Is the function such that $f(z) = \dfrac{Im(z^2)}{|z|^2}$ for $z \neq 0$ and $f(0) = 0$,continuous at z =0   6M

   b) If f (z) is analytic prove that $i)\ \left(\dfrac{\partial}{\partial x^2} + \dfrac{\partial}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ 6M
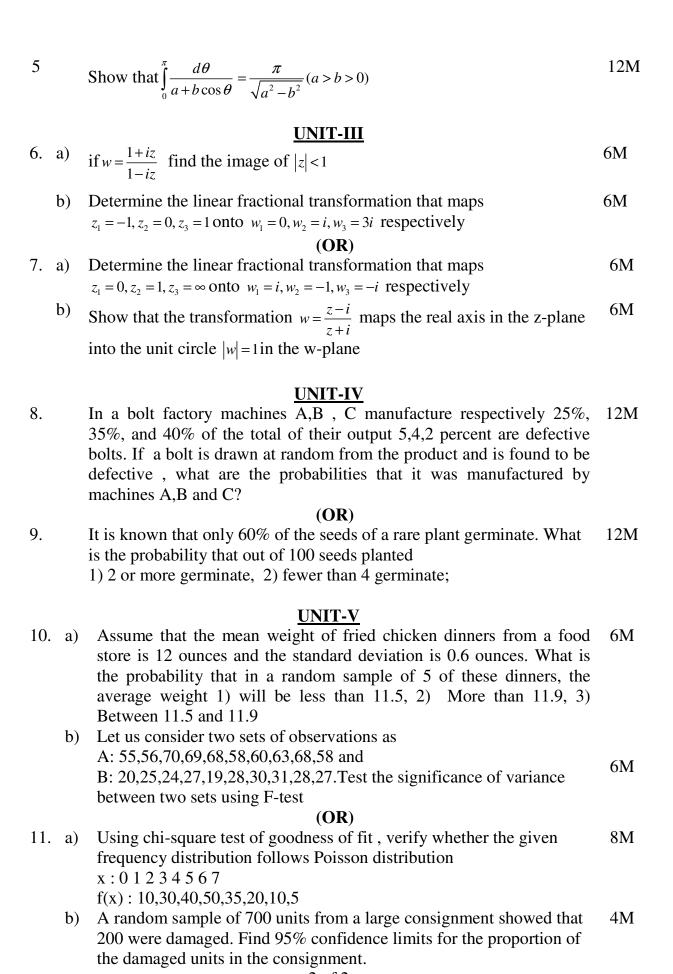
(OR)

3.   Check that u(x, y)=2xy is harmonic, and find its harmonic conjugate v   12M

UNIT-II

4. a) Find the residue at each pole of the $f(z) = \dfrac{z^2 - 2z}{(z+1)^2(z^2+4)}$ 6M

    b) Evaluate $\int_C \dfrac{5z-2}{z(z-1)}dz$ where $C:|z|=2$ 6M

(OR)

5   Show that $\int_0^{\pi} \dfrac{d\theta}{a+b\cos\theta} = \dfrac{\pi}{\sqrt{a^2-b^2}} (a>b>0)$ 12M

UNIT-III

6. a) if $w = \dfrac{1+iz}{1-iz}$ find the image of $|z|<1$ 6M

   b) Determine the linear fractional transformation that maps   6M
   $z_1 = -1, z_2 = 0, z_3 = 1$ onto $w_1 = 0, w_2 = i, w_3 = 3i$ respectively

(OR)

7. a) Determine the linear fractional transformation that maps   6M
   $z_1 = 0, z_2 = 1, z_3 = \infty$ onto $w_1 = i, w_2 = -1, w_3 = -i$ respectively

   b) Show that the transformation $w = \dfrac{z-i}{z+i}$ maps the real axis in the z-plane   6M
   into the unit circle $|w|=1$ in the w-plane

UNIT-IV

8. In a bolt factory machines A,B , C manufacture respectively 25%, 35%, and 40% of the total of their output 5,4,2 percent are defective bolts. If a bolt is drawn at random from the product and is found to be defective , what are the probabilities that it was manufactured by machines A,B and C?   12M

(OR)

9. It is known that only 60% of the seeds of a rare plant germinate. What is the probability that out of 100 seeds planted   12M
1) 2 or more germinate, 2) fewer than 4 germinate;

UNIT-V

10. a) Assume that the mean weight of fried chicken dinners from a food store is 12 ounces and the standard deviation is 0.6 ounces. What is the probability that in a random sample of 5 of these dinners, the average weight 1) will be less than 11.5, 2) More than 11.9, 3) Between 11.5 and 11.9   6M

    b) Let us consider two sets of observations as
    A: 55,56,70,69,68,58,60,63,68,58 and
    B: 20,25,24,27,19,28,30,31,28,27.Test the significance of variance between two sets using F-test   6M

(OR)

11. a) Using chi-square test of goodness of fit , verify whether the given frequency distribution follows Poisson distribution   8M
    x : 0 1 2 3 4 5 6 7
    f(x) : 10,30,40,50,35,20,10,5

    b) A random sample of 700 units from a large consignment showed that 200 were damaged. Find 95% confidence limits for the proportion of the damaged units in the consignment.   4M

AR13

FLUID MECHANICS & HYDRAULIC MACHINES
(Electrical & Electronics Engineering)

Time: 3 Hours   Max Marks: 70

PART-A

ANSWER ALL QUESTIONS   **[1 x 10 = 10 M]**

1. a) Define weight density of a fluid?
    b) Define kinematic viscosity
    c) Define streamline
    d) Differentiate Steady and Unsteady flow.
    e) Mention the assumptions involved in deriving Bernoulli's Theorem.
    f) What is the purpose of pitot tube
    g) Define coefficient of discharge
    h) Give an example for an impulse turbine
    i) What are the important components in a centrifugal pump
    j) Define slip in case of reciprocating pumps

PART-B

Answer one question from each unit   **[5x12=60M]**

UNIT-I

2. a) Calculate the specific weight, density and specific gravity of   6M
        one litre of a liquid which weighs 7 N
    b) State and explain Newton's law of Viscosity   6M
                            (OR)
3.   The left leg of a U- tube mercury manometer is connected to   12M
        pipe line conveying water, the level of mercury in the leg
        being 0.6 m below the centre of the pipe line, and right leg is
        open to atmosphere. The level of mercury in the right leg is
        0.45 m above that of left leg and the space above the mercury
        in the right leg contains Benzene (specific gravity 0.88) to a
        height of 0.3 m. Find the pressure in the pipe

UNIT-II

4. Derive the continuity equation for two Dimensional flow   12M

(OR)

5. Derive the Bernoulli's equation along a stream line   12 M

UNIT-III

6. a) Explain Reynolds experiment with a neat sketch   6M
    b) Derive the expression for coefficient of discharge for a   6M
        venturimeter

(OR)

7. a) Derive the expression for head loss due to friction in a pipe   6M
    b) Three pipes of lengths 800 m, 500 m and 400 m of diameters   6M
        500 mm, 400mm, and 300 mm respectively are connected in
        series. These pipes are to be replaced by a single pipe of
        length 1700 m. Find the diameter of the single pipe

UNIT-IV

8. Explain the working of Pelton wheel turbine with neat Sketch   12M

(OR)

9. a) What is draft tube? What are the purposes served by draft   6M
        tube?.
    b) A turbine develops 9000 kW when running at 10 r.p.m. The   6M
        head on the turbine is 30 m. If the head on the turbine is
        reduced to 18 m, determine the speed and power developed
        by the turbine

UNIT-V

10.   What is the difference between single-stage and multistage   12M
        pumps? Describe multistage pump with i) impellers are in
        parallel ii) impellers are in series.

(OR)

11. a) Explain the working of reciprocating pump with neat sketch   6M
    b) A single acting reciprocating pump running at 50 rpm   6M
        delivers 0.013 m^3 /sec of water. The diameter of the piston
        is 200 mm and stroke length 400 mm.   Determine:
        (i) Theoretical discharge (ii) Coefficient of discharge

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Code: 13EC2005   **Set-I**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
II B.Tech I Semester Supplementary Examinations, January-2019
PROBABILITY THEORY & STOCHASTIC PROCESSES
(Electronics and Communication Engineering)

Time: 3 hours   Max. Marks: 70M

PART - A

Answer all questions   **[10 X 1 = 10]**

1. a) Give the classical definition of probability?
   b) State Bayes' theorem?
   c) Define Gaussian density function.
   d) What is CDF & PDF of Poisson random variable?
   e) Write the conditional for validity of a joint density function?
   f) Define joint characteristic function of two random variables.
   g) What do you mean by mean-Ergodic process?
   h) What is auto-correlation function?
   i) Write any two properties of cross power density spectrum?
   j) Define white noise.

PART - B

Answer one question from each unit   **[5 X 12 = 60M]**

UNIT-I

2.a In a college, there are 500 students out of which 230 are girls. It is known that out of 230, 10% of the girls students in class X. What is the probability that a student chosen at random studies in class X given that the chosen student is a girl.   4M

b A shipment of components consists of three identical boxes. One box contains 2000 components of which 25% are defective, the second box has 5000 components of which 20% are defective and the third box contains 2000 components of which 600 are defective. A box is selected at random and a component is removed at random from a box. What is the probability that this component is defective? What is the probability that is came from the second box.   8M

(OR)

3.a Define probability based on set theory and fundamental axioms.   6M

b Prove Bayes' theorem   6M

UNIT-II

4.a Define the probability density function and its properties.   6M

b The density function of a random variable X is $f_X(x) = \begin{cases} 5e^{-5x} ; & 0 \le x \le \infty \\ 0; & elsewhere \end{cases}$. Find (a) E[X], (b) E[(X-1)^2], and (c) E[3X-1].   6M

5.a Show that a linear transformation of Gaussian Random Variables produces Gaussian Random Variables. 6M

  b If X is uniformly distributed over (0, 10). Calculate the probability that (a) X > 6 and (b) 3 < X < 8. 6M

UNIT-III

6.a Define joint distribution and density functions of two random variables X and Y. Give its properties. 8M

  b The joint pdf of (X. Y) is given by $f_{X,Y}(x,y) = \begin{cases} k\,x^2(4-y) & ; \ x < y > 2x, 0 < x < 2x \\ 0 & ; \ elsewhere \end{cases}$. 4M

  Where k is a constant, is a valid density function. Find k.

(OR)

7.a Explain the method for finding the distribution and density functions for a sum of statistically independent random variables. 6M

  b If the joint density function of two random variables X and Y are $f_{X,Y}(x,y) = \begin{cases} e^{-(x+y)} & ; \ x \geq 0, \ y \geq 0 \\ 0 & ; \ otherwise \end{cases}$. Find (a) P(X < 1) and (b) P(X+Y < 1). 6M

UNIT-IV

8.a Two random variables X and Y are jointly Gaussian. Show that the joint probability density function is the product of density functions of X and Y respectively. 4M

  b Gaussian random variables X1 and X2 for which $\overline{X_1} = 1, \sigma_{X_1}^2 = 4, \overline{X_2} = 2, \sigma_{X_2}^2 = 9$ and $C_{X_1X_2} = -2$ are transformed to new random variables Y_1 and Y_2 according to $Y_1 = 2X_1 + X_2$ and $Y_2 = -X_1 + X_2$. Find (a) $E[X_1^2]$, (b) $E[X_2^2]$, (c) $\rho_{X_1X_2}$, (d) $\sigma_{Y_1}^2$, (e) $\sigma_{Y_2}^2$ and (f) $C_{Y_1Y_2}$ 8M

(OR)

9.a State and prove the properties of Auto correlation function. 6M

  b If $X(t) = \cos(\omega t + \phi)$ where Ø is uniformly distributed in (-π, π), show that X(t) is stationary in wide-sense. 6M

UNIT-V

10.a Explain the Power Density Spectrum and write their properties. 4M

  b Derive the relation between power spectral density and auto correlation function. 8M

(OR)

11.a What are the different methods of noise calculation? Explain each of them briefly. 6M

  b An electronic circuit has an amplifier followed by a mixer stage. The noise figure of the amplifier and mixer are 30dB and 20dB respectively. If the power gain of the amplifier is 10dB, calculate the overall noise figure referred to the input. 6M