MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

Third Semester Department of EEE

MA3303-Probability and Complex Function

(Regulation 2021)

SUBCODE: MA3303

Time: *UNIT-I- Question Bank* Maximum Marks:100

1. The probability density function of a continuous random variable X is given by $f(x) = Ke^{-|x|}$ Find K and $C.D.F$ of X.
2. X and Y are independent random variable with variance 2 and 3. Find the variance of 3X+4Y.
3. continuous random variable has a probability density function $F(x) = 3x^2$; $0 \leq x \leq 1$. Find $P(x \leq a) = P(x > a)$
4. If the probability is $\frac{1}{4}$ that a man will hit a target, what hit the chance that the will hit the target for the first time in 7th trail.
5. If X is a Poisson variate such that $P(X = 2) = 9P(X = 4) = 909(X = 6)$.
6. Comment the following mean of a binommial distribution is 3 and variance is 4.
7. If X is uniformly distribution with mean 1 and variance $\frac{4}{3}$.
8. If X and Y are independent binomial Variates $B(5.\frac{1}{2})$ and $B(5.\frac{1}{2})$ find $P[X > 0]$.
9. If the random variable X has the p.d.f $f(x) = \frac{1(x+1)}{2}$; $-1 < x < 1$, find the variance and mean of X.
10 A random variable has density function given by $f(x) = 2e^{-2x}$; $X > 0$
11. write the characteristic of Normal Distribution.
12. If X is $N(2, 3)$ in $P[Y \geq \frac{3}{2}]$ where $Y + 1 = X$

$$Part - B$$

11. (i)Let be a random variable following poss ion distribution such that $P(X = 2) = 9p(X = 4) + P(X = 6)$. Find the mean and variance
(ii) A machine consists of 2000 equally reliable part with a probability that the machine will fail to operator if failure occurs when , at least, one part failure to operate.
12. A random variable X has the following probability function.

Values of X=x	0	1	2	3	4	5	6	7
P(X=x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

(i) Find the value of K, (ii) Evaluation $P(X < 6)$,$P(X > 6)$ and $P(0 < x < 5)$,
(iii) Find minimum value of "a" such that $P(X < a) > \frac{1}{2}$
(iv)Find the distribution function of X (13) A random variable X has the following probability function.

X	0	1	2	3	4	5	6	7	8
P(X=x)	a	3a	5a	7a	9a	11a	13a	15a	17a

(i) Find the value of a, (ii) Evaluation $P(X < 3)$,$P(0 < X < 3)$ and $P(x > 3)$,
(iv)Find the distribution function of X
14. In a company manufacturing industry there is a small probability of $\frac{1}{500}$ for any component to be defective. The component are supplied in packet of 10. Use Poisson distribution to calculate the approximation number of packets containing (i) defective (ii)one defective component (iii)two

defective component in a consignment of 10,000 packets.

(15) i. write down mean and variance of geometric distribution (ii) A man eighth n keys wants to open his door and tries the keys independently at random. Find the mean and variance of number of trial required to open the door(i) if unsuccessful keys are not eliminated from further selection, and (ii) if they are elimination from further selection.

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Time: *UNIT-II-Question Bank* Maximum Marks:100

1. Let X and Y have joint density function $f(x, y) = 2 \ 0 < x, y < 1$, Find the marginal density function and the conditional density function Y given $X = x$
2. Two random variable X and Y have the joint p.d.f $f(x, y) = Ae^{-(2x+y)}$, $x, y \geq 0$. Find A.
3. verify whether X and Y are independent if $f(x, y) = kxy$, $0 \leq x \leq y, 0 \leq y \leq 4$
4. Two random variable X and Y have the joint p.d.f $f(x, y) = x + y$, $0 \leq x \leq 1, 0 \leq y \leq 1$
5. Examine whether the variable X and Y are independent, whose joint density function is $f(x, y) = xe^{x(y+1)}$, $0 \leq x, 0 \leq y \leq \infty$
6. write the angle between the regression line
7. State Center limit theorem
8. If X has an exponential distribution with parameter 1. Find pdf of $y = \sqrt{x}$
9. If X is uniformly distribution random variable in $\left(\frac{-\pi}{2}, \frac{-\pi}{2}\right)$. Find the probability density function of $Y = tanx$
10. If X and Y are random Variables. Prove that $Cov(X, Y) = E(XY) - E(X)E(Y)$
11. If X and Y are independent random variables prove that $Cov(x, y) = 0$
12. Write any two properties of regression coefficients

Attend All Question

$$PARTB(5X16 = 80)$$

13. The joint probability function of (X, Y) is given by $P(x, y) = K(2x + 3y)$ and y=1,2,3. Find the marginal probability of X, Also find the probability distribution of $(X + Y)$ and $P(x + y > 3)$.

14. Three ball are drawn random with out replacement from a box containing 2 whit 3 red and 4 black balls. drawn and Y denotes the number of red ball drawn. find the joint probability distribution of (X+Y).
15. If X and Y are random variables having the joint density function $f_{XY}(xy) = \frac{6-x-y}{8}$, $0 < x < 2, 2 < Y < 4$
(i) Find $P(X + Y < 3)$, (ii) Find $P(X < 3, Y < 3)$, (iii) $P(X < 1/Y < 3)$
16. If X and Y have joint probability density function

$$f_{XY}(x, y) = \begin{cases} e^{-(x+y)}, & \text{if } x \geq 0,\ y \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

Find (i) the marginal density function of X and Y and verify X and Y are independent or not. (ii) $P(X < 1)$, (iii) $P(X + Y < 1)$, (iv) $P(0 < X < 1/Y \neq 1)$,(V) $P(X > Y)$
17. The following tables gives the joint probability distribution of two random variable X and Y. Find E(X), E(Y) E(XY), verify whether X and Y are correlated

X/Y	0	1	2	3
2	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
3	$\frac{1}{16}$	$\frac{1}{8}$	0	$\frac{1}{16}$
4	$\frac{1}{16}$	0	$\frac{1}{8}$	$\frac{1}{16}$

18. The joint probability density function of two random variable (X,Y) ix given by $f_{XY}(x,y) = xy^2 + \frac{x^2}{8}$, $0 \leq x \leq 2$,$0 \leq y \leq 1$.
Compute $P(X > 1)$, $P(Y < \frac{1}{2})$ $P(X > 1/Y < \frac{1}{2})$ $P(Y < \frac{1}{2}/X > 1)$
$P(X < Y)$ and $P(X + Y \leq 1)$ 19. the joint probability density function of random variable X and Y is given by $f_{XY}(x, .y) = Kxye^{-(x^2+y^2)}$ Find the value of K and also prove that that X and Y are independent
20. If X and Y have joint probability density function

$$f_{XY}(x,y) = \begin{cases} x+y, & \text{if } 0 < x < 1,\ 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find verify X and Y are independent or not.

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Time: *UNIT-III-Question Bank* Maximum Marks:100

1. Show that the function $f(Z) = e^{x-iy}$ is nowhere analytic.
2. Sate the sufficient Condition For the function tp be analytic.
3. State the necessary and sufficient condition for $f(z)$ be analytic .
4. Find the image of $|Z-1| > \frac{1}{2}$ under the transformation $w = iz$
5. Sate whether $sin(x+iy)$ is analytic or not.
6. Define the bilinear transformation or mobius transformation.
7.Find the constant a.b if $f(z) = x + 2ay + i3(3x + by)$ is analytic
8. verify whether the function $u = x^3 + 3xy^2 + 3x^2 - 3y^2 + 1$ harmonic.
9. Find the image of line $x = k$ under the transformation $w = \frac{1}{z}$.
10. Find the invariant point of $f(z) = z^2$.
11 Find fixed point of biliner transformation $W = \frac{1}{z}$.
12 find the invariant point of transformation $w = \frac{z-1}{z+1}$.

$$PARTB(5X16 = 80)$$

13 If f(z) is a analytic function of Z $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$
14. (i)Show that $u = e^x(xcosy - ysiny)$ is harmonic and Hence find the analytic function
(ii) Prove that $u = x^2 - y^2$ and $v = \frac{-y}{x^2+Y^2}$ are harmonic function but not no harmonic conjugate.
15.(i) Find the image of $|Z+1| = 1$ under the mapping $w = \frac{1}{z}$
(ii) Find the image of the circle$|z-2i| = 2$ under the transformation $W = \frac{1}{z}$
16.(i) Discuss the transformation of $W = Z^2$
(ii)Discuss the transformation of $W = \frac{1}{z}$
17. Find the bilinear transformation which maps the point z=0 ,1,-1 onto the points w=-1, 0, ∞ find the inverse image of the transformation.
18. Find the bilinear trans transformation which maps the points -1,0,1 of the z-plane into the point into the -1,-i,1 of the w-plane respectively.
18 Find the bilinear transform which maps i,-i,1, in z plane into 0,1,∞ of w-plane.

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MA3303-Probability and Complex Function

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Time: *Unit-IV-Question Bank* Maximum Marks:100

1. State Cauchy's integral formula theorem.
2. What is the value of $\int_c \frac{3z^2+7z+1}{Z+1}$ is $|Z| = \frac{1}{2}$.
3. Evaluate $\int_c e^{\frac{1}{Z}} dz$, where C is $|Z| = 1$
4. Evaluate $\int_c \frac{e^z}{Z-1} dz$, where C is $|Z+3| = 1$
5. Evaluate $\int_c (x^2 - y^2 + 2ixy) dz$, where C is $|Z| = 1$
6. State Cauchy Residue theorem.
7. what are poles of $zcotz$, $tanz$.
8. Define Essential and removable singular point of f(Z).
9. Identify the type of the singularity of the function $sin(\frac{1}{1-Z})$.
10. Evaluate $\int_c \frac{z}{(Z-1)^3} dz$, where C is $|Z| = 2$. using cauchy's integral formula.
11. expand $f(z) = log(1+z)$ in a Taylor's series about $Z = 0$ if$|Z| < 1$.
12. Find the Residue of $f(Z) = \frac{Z-3}{(z-2)(z+2)}$ as its pole.

$PARTB(5X16 = 80)$

13. Using Cauchy integral formula evaluate $\int_c \frac{Z+4}{Z^2+2Z+5} dz$, where C is circle$|z+1+i| = 2$
14. Using Cauchy integral formula evaluate $\int_c \frac{Z+1}{(z-3)(Z-1)} dz$, where C is circle$|| = 2$
15. Evaluate $\int_0^{2\pi} \frac{d\theta}{13+cos\theta} dz$
16. Evaluate $\int_{-\infty}^{\infty} \frac{cosxdx}{(x^2+a^2)(x^2+b^2)}$
15. Expand $f(z) = \frac{Z^2}{(z+1)(z+3)}$ as a Laurents series of the region $|Z| < 2$, and $1 < Z < 3$ and $|z| > 3$.
17. Find the laurent's series $f(z) = \frac{7Z}{z(z+1)(z+2)}$ in$1 < |Z+1| < 3$.
18. Obtained the laurent's series $f(z) = \frac{Z^2-4z+2}{z^3-2z^2-5z+6}$ in$3 < |Z+2| < 5$.

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Time: *Unit-V-Question Bank* Maximum Marks:100

1. Find the particular integral for $(D+1)^3y = e^{-x}$
2.Solve: $(D^2+D+1)y = 3$
3. Find the auxiliary equation $(D^3-3D^2+3D-1)y = 0$
4. solve: $((1+2x)^2D^2-(1+2x)D+1)y = 0$
5. Find the wronskian of $\frac{dy^2}{dx^2}+4y = 4tan2x$
6. particular integral for $(D^4+D^2)y = sin3x$
7. Solve: $(D^2+1)y = x^2$
8. Solve: $(D^3+6D^2+12D+8)y = 0$
9. Find the particular integral of $(D-1)^2y = e^x sinx$
10.Solve: $(D^2+D+1)y = e^{2x}$
11. Find the particular integral $(D^2+D+1)y = x$
12.Solve: $(D^2+D+1)y = e^{2x}+e^{4x}$

$PARTB(5X16 = 80)$

11. (i) Solve: $(D^2-3D+2)y = 2cos(2x+3)+ 2e^x$
(ii) solve $y^{''}+y = sin^2x$.
12. solve $\frac{dx}{dt}-y = t$, $\frac{dy}{dt}+x = t^2$.
solve $\frac{dx}{dt}+2x-3y = t$, $\frac{dy}{dt}+2y-3x = e^{2t}$.
13. (i)solve $\frac{dx}{dt}+2y = 5e^t$, $\frac{dy}{dt}-2x = 5e^t$. given that x=-1 and $y = 3$ at $t = 0$
(ii)$Dx+y = sin2t$, $-x+Dy = cos2t$, given the $x = 2$ and $y = 0$ at t=0
14. (i)Solve $(2x+3)^2\frac{dy^2}{dx^2}-2(2x+3)\frac{dy^2}{dx^2}-2y = 6x$
(ii)Solve $(x+2)^2\frac{dy^2}{dx^2}-(x-2)\frac{dy^2}{dx^2}+y = 3x+4$
15.Solve $(3x+2)^2\frac{dy^2}{dx^2}+3(3x+2)\frac{dy^2}{dx^2}-36yy = 3x^2+4x+1$
16 (i)Solve $\frac{dy^2}{dx^2}+4y = 4tan2x$ using Method of variation of parameters.
(ii)Solve $\frac{dy^2}{+}4y = cotx$ using Method of variation of parameters.
17. Solve $\frac{dy^2}{dx^2}+4y = 5e^x cosx$ using Method of undermined co-efficient.