

INSTITUTEOFAERONAUTICALENGINEERING

(Autonomous) Dundigal, Hyderabad - 500043

AERONAUTICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	Complex Analysis and Probability Distribution
Course Code	:	AHS004
Class	:	II B. Tech II Semester
Branch	:	AERO
Academic Year	:	2018 - 2019
CourseCoordinator	:	Ms. C Rachana, Assistant Professor
	:	Mr. Ch Soma shekhar, Assistant Professor
Course Faculty		Mr. J Suresh Goud, Assistant Professor
		Ms. P Rajani, Assistant Professor

COURSE OBJECTIVES (COs):

The course should enable the students to:

Ι	Understand the basic theory of complex functions to express the power series.
II	Evaluate the contour integration using Cauchy residue theorem.
III	Enrich the knowledge of probability on single random variables and probability distributions.

COURSE LEARNING OUTCOMES (CLOs):

Students, who complete the course, will have demonstrated the ability to do the following:

CAHS004.01	Define continuity, differentiability, analyticity of a function using limits.
CAHS004.02	Understand the conditions for a complex variable to be analytic and/or entire function.
CAHS004.03	Understand the concepts of Cauchy-Riemann relations and harmonic functions.
CAHS004.04	Understand the concept of complex differentiation to the real-world problems of signals modulated by electromagnetic waves.
CAHS004.05	Evaluate the area under a curve using the concepts of indefinite integration
CAHS004.06	Understand the concepts of the Cauchy's integral formula and the generalized Cauchy's integral formula.
CAHS004.07	Evaluate complex functions as power series and radius of convergence of power series.
CAHS004.08	Understand the concept of complex integration to the real-world problems of flow with circulation around a cylinder.
CAHS004.09	Solve the Taylor's and Laurent series expansion of complex functions
CAHS004.10	Understand the concept of different types of singularities for analytic function.

CAHS004.11	Evaluate poles, residues and solve integrals using Cauchy's residue theorem.
CAHS004.12	Evaluate bilinear transformation by cross ratio property.
CAHS004.13	Identify the conditions of fixed and critical point of Bilinear Transformation.
CAHS004.14	Understand the concept of Cauchy's residue theorem to the real-world problems of Quantum Mechanical scattering and Quantum theory of atomic collisions.
CAHS004.15	Demonstrate an understanding of the basic concepts of probability and random variables.
CAHS004.16	Classify the types of random variables and calculate mean, variance.
CAHS004.17	Finding moment about origin, central moments, moment generating function of probability distribution.
CAHS004.18	Understand the concept of random variables to the real-world problems like graph theory, machine learning and natural language processing
CAHS004.19	Recognize where the binomial distribution and poisson distribution could be appropriate model and find mean, variance of the distributions.
CAHS004.20	Apply the inferential methods relating to the means of normal distributions.
CAHS004.21	Understand binomial distribution to the phenomena of real-world problem like sick versus healthy.
CAHS004.22	Understand the mapping of normal distribution in real-world problem to analyze the stock market.
CAHS004.23	Use poission distribution in real-world problem to predict soccer scores.
CAHS004.24	Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.

TUTORIAL QUESTION BANK

UNIT-I					
	COMPLEX FUNCTIONS AND DIFFERENTIATION				
	Part - A(Short Answer Questions)				
S No	QUESTIONS	Blooms Taxonomy Level	Course Learning Outcomes (CLOs)		
1	Define the term Analyticity of a complex variable function f (z).	Remember	CAHS004.1		
2	Define the term Continuity of a complex variable function f (z).	Remember	CAHS004.1		
3	Define the term Differentiability of a complex variable function f (z).	Remember	CAHS004.1		
4	If $w = f(z) = z^2 + z$. Find its real and imaginary parts.	Remember	CAHS004.1		
5	Examine the complex variable function $f(z) = z^3$ to analyticity for all values of z in Cartesian form.	Understand	CAHS004.2		
6	Verify whether the function $v = x^3y - xy^3 + xy + x + y$ can be imaginary part of an analytic function f (z) where $z = x + iy$.	Understand	CAHS004.2		
7	Show that the function $f(z) = z ^2$ does not satisfy Cauchy-Riemann equations in Cartesian form.	Understand	CAHS004.3		
8	Examine the complex variable function $f(z) = \frac{x-iy}{x^2+y^2}$ for analyticity in Cartesian form.	Understand	CAHS004.2		
9	Interpret whether the function $f(z) = \sin x \sin y - i \cos x \cos y$ is an analytic function or not in Cartesian form.	Understand	CAHS004.2		
10	Calculate the value of k such that $f(x, y) = x^3 + 3kxy^2$ may be harmonic function.	Understand	CAHS004.3		
11	Determine the most general analytic function f (z) whose real part of the analytic function is $u = x^2 - y^2 - x$.	Understand	CAHS004.2		
12	Obtain an analytic function f (z) whose imaginary part of the analytic function is $v = e^x(xsiny + ycosy)$.	Understand	CAHS004.2		
13	Show that the real part of an analytic function $f(z)$ where u = 2log ($x^2 + y^2$) is harmonic.	Understand	CAHS004.3		
14	Determine the conjugate harmonic function if the real part of an analytic function $f(z)$ is $u = y^2 - 3x^2y$ is harmonic function.	Understand	CAHS004.3		
15	Estimate the values of w which correspond to $z = 1+3i$ when $w = f(z) = z^2$.	Understand	CAHS004.3		
16	Show that the function $f(z) = z ^2$ is continuous at all points of z but not differentiable at any $z \neq 0$.	Understand	CAHS004.1		
17	Calculate all the values of k such that $f(z) = e^{x}(cosky + isinky)$ is an analytic function.	Understand	CAHS004.2		
18	Determine the values of a, b, c such that $f(z) = x + ay - i(ax+by)$ is differentiable function at every point.	Understand	CAHS004.1		
19	Verify whether $u = x^2 - y^2 - y$ of an analytic function can be harmonic function of an analytic function f (z) in the whole complex plane.	Understand	CAHS004.3		
20	Justify whether every differentiable function is continuous or not. Give a valid example.	Remember	CAHS004.1		
	Part - B (Long Answer Questions)				
1	Show that the real part of an analytic function f (z) where	Understand	CAHS004.3		

	$u = e^{-2xy} \sin(x^2 - y^2)$ is a harmonic function. Hence find its harmonic		
	conjugate.		
	Prove that the real part of analytic function $f(z)$ where $u = \log z ^2$ is		
2	harmonic function. If so find the analytic function by Milne Thompson	Understand	CAHS004.3
	method.		
3	Determine the imaginary part of an analytic function $f(z)$ whose real part of an analytic function $f(z)$ whose real part of	Understand	CAHS004.2
	Obtain the regular function $f(x)$ whose imaginary part of an analytic		
4	function is x^{-y}	Understand	CAHS004.2
	Tunction is $\frac{1}{x^2 + y^2}$.		
5	If $f(z) = u + iv$ is an analytic function of z, then calculate $f(z)$ if	Understand	CAHS004.2
	$\frac{2u + v = e^{-1} [(2x+y) \cos 2y + (x-2y) \sin 2y]}{(a^2 - a^2)}$		
6	Prove that $\left(\frac{\partial}{\partial x^2} + \frac{\partial}{\partial y^2}\right) Realf(z) ^2 = 2 f'(z) ^2$ where w = f (z) is an	Understand	CAHS004.2
Ŭ	analytic function.	Charlotana	01112000112
_	Find an analytic function f (z) whose real part of an analytic function is		
7	$u = \frac{sin2x}{1}$ by Milne-Thompson method.	Understand	CAHS004.3
	$\frac{\cos(2y) - \cos(2x)}{\cos(2y) - \cos(2x)} = \frac{1}{2} \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial x^2} \right) \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial x^2} \right)$		
8	If f (z) is a regular function of z, then prove that $\left(\frac{\partial x^2}{\partial x^2} + \frac{\partial y^2}{\partial y^2}\right) f(z) ^2 =$	Understand	CAHS004.2
	$4 f'(z) ^2$.		
	Show that the function defined by $f(z) = \left(\frac{xy^2 (x+iy)}{2}, x \neq 0\right)$		
9	Show that the function defined by $I(Z) = \begin{cases} x^2 + y^2 \\ 0 & z = 0 \end{cases}$	Understand	CAHS004 3
	is not analytic function even though Cauchy Riemann equations are satisfied	Onderstand	CA115004.5
	at origin.		
10	Show that real part $u = x^3 - 3xy^2$ of an analytic function f (z) is harmonic.	Understand	CAHS004 3
10	Hence find the conjugate harmonic function and the analytic function.	Understand	CAI15004.5
11	Find an analytic function $f(z) = u + iv$ if the real part of an analytic function	Understand	CAHS004.3
	$1s u = a (1+\cos\theta)$ using Cauchy-Riemann equations in polar form.		
12	Derive Cauchy-Riemann equations in polar form of an analytic function $f(z)$	Remember	CAHS004.3
10	Prove that the real and imaginary parts of an analytic function $f(z)$ are	D 1	G + 11000 / 0
13	harmonic.	Remember	CAHS004.3
14	Find the analytic function f (z) whose imaginary part of an analytic function	Understand	CAUS004 2
14	is $r^2 cos 2\theta + r sin\theta$ by Cauchy Riemann equations in polar form.	Understand	CAH5004.5
15	Prove that the function $f(z) = z $ is continuous everywhere but nowhere	Remember	CAHS004 1
	differentiable.		
16	Show that the real part of an analytic function f (z) where $y = e^{-x} (y_{z}) (y_{z$	Understand	CAHS004.3
	$u = e^{-x} (xstny - ycosy)$ is a narmonic function. Prove that an analytic function $f(z)$ with constant real part is always		
17	constant	Remember	CAHS004.2
10	Prove that an analytic function $f(z)$ with constant modulus is always		~
18	constant.	Remember	CAHS004.2
10	Verify Cauchy –Riemann equation to the function $f(z) = z e^{-z}$ in Cartesian	Understand	CAHS004 3
17	form.	Understand	CA115004.3
20	If u and v are conjugate harmonic functions then show that uv is also a	Remember	CAHS004.3
	narmonic function.		
	rart - C (Froblem Solving and Critical Liniking Question) 	
1	If t (z) is an analytic function of z such that $u + v = \frac{contact}{cosh2y - cos2x}$ then	Understand	CAHS004.1
	determine the analytic function f(z) in terms of z.		
2	If u is a harmonic, show that $w = u^2$ is not a harmonic function unless u is a	Remember	CAHS004.3

	constant.		
2	Prove that if $u = x^2 - y^2$, $v = -\frac{y}{x^2 + x^2}$ both u and v satisfy Laplace's	The demoter of	
3	equation, but $u + iv$ is not a regular (analytic) function of z.	Understand	CAHS004.3
	If f(z) is an analytic function and u - y = $\frac{\cos x + \sin x - e^{-y}}{\sin x - e^{-y}}$ then determine the		
4	analytic function f(z) subjected to the condition f $(\frac{\pi}{2}) = 0$.	Understand	CAHS004.2
5	Find an analytic function $f(z)$ whose real part of it is	Understand	CAHS004.2
	$u = e^{x} [(x^{2} - y^{2}) \cos y - 2xy \sin y)].$	Charlotana	
6	Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log f'(z) = 0$ where w = f (z) is an analytic	Understand	CAHS004.2
	function.		
7	Find the analytic function $f(z) = u(r, \theta) + i v(r, \theta)$ such that $v(r, \theta) =$	Understand	CAHS004 3
	$\left(r-\frac{1}{r}\right)sin\theta$, $r\neq 0$ using Cauchy-Riemann equations in polar form.	Understand	CAI15004.5
	Find an analytic function f (z) such that $\operatorname{Re}[f'(z)] = 3x^2 - 4y - 3y^2$ and	TT 1 . 1	
8	f(1+i) = 0.	Understand	CAHS004.2
_	Show that the function $f(z) = \sqrt{ xy }$ is not analytic at the origin although		~
9	Cauchy – Riemann equations are satisfied at origin.	Remember	CAHS004.3
10	If $w = \phi + i\phi$ represents the complex potential for an electric field where	TT 1 / 1	CAUGO04.2
10	$\varphi = x^2 - y^2 + \frac{x}{x^2 + y^2}$ then determine the function φ .	Understand	CAHS004.3
	UNIT-II		
	COMPLEX INTEGRATION		
	Part - A (Short Answer Questions)		
1	Write the Cauchy's integral formula.	Remember	CAHS004.6
2	Write the Cauchy's General integral formula.	Remember	CAHS004.6
3	Define the term Radius of convergence.	Remember	CAHS004.7
4	Define the term Power series expansions of complex functions.	Remember	CAHS004.7
5	Define the term Line Integral of complex variable function $w = f(z)$.	Remember	CAHS004.5
6	Define the term Contour Integration of a given curve in complex function.	Remember	CAHS004.5
7	State Cauchy's integral theorem for multiple connected region.	Remember	CAHS004.6
8	Estimate the value of $\int_{0}^{1+i} z^2 dz$.	Understand	CAHS004.5
9	Estimate the value of $\int \frac{3z^2 + 7z + 1}{(z+1)} dz$ with C: $ z+i = 1$ by Cauchy integral	Understand	CAHS004.6
	formulae		
	Determine the value of line integral to $\int_{0}^{2+i} z^{2} dz$ along the real axis to 2 and		
10	then vertically to $(2+i)$.	Understand	CAHS004.5
11	Determine the value of line integral to $\int_{a}^{3+i} z^2 dz$ along the straight line y =	I.I. de meter e d	
11	x/3.	Understand	CAH5004.5
10	Examine the value of $\int e^{-z} dz$ with C: $ z - 1 = 1$ by Cauchy integral		
12	c	Understand	CAHS004.6
	$\sum_{i=1}^{n} \frac{1}{2} + i = 1 + \frac{1}{2} + \frac{1}$		
13	Determine the value of line integral to $\int_0^1 (x - y^2 + ix^3) dz$ along the real axis from $z = 0$ to $z = 1$	Understand	CAHS004.5
\vdash	axis from $z=0$ to $z=1$.		
14	Determine the value of the line integral $\int_{a}^{b} zdz$ from $z = 0$ to 2i and then from		CAHS004 5
14	2i to z = 4 + 2i.	Understand	C/ 110007.0
15	Estimate the radius of convergence of an infinite series $f(z) = sinz$.	Understand	CAHS004.7

16	Estimate the radius of convergence of an infinite series $f(z) = \frac{1}{1-z}$.	Understand	CAHS004.7
17	Estimate the radius of convergence of an infinite series $1+2^2z+3^2z^2+4^2z^3+$	Understand	CAHS004.7
18	Evaluate $\int_{0}^{1+i} (x^2 - iy) dz$ along the path $y = x$.	Remember	CAHS004.5
19	Estimate the value of $\int_{C} \frac{1}{z-2} dz$ around the circle $ z-1 = 5$ by Cauchy	Understand	CAHS004.6
20	Prove that by using line integral, $\int_C \frac{1}{(z-a)} dz = 2\pi i$ where c is the curve $ z-a = r$	Remember	CAHS004.5
	Part - B (Long Answer Questions)		
1	Estimate the value of line integral to $\int_{c} \frac{z^3 - \sin 3z}{(z - \pi/2)^3} dz$ where c is the circle	Understand	CAHS004.6
2	Verify Cauchy's theorem for the integral of z^3 taken over the boundary of the rectangle formed with the vertices -1, 1, 1+i, -1+i.	Understand	CAHS004.6
3	Determine the value of line integral to $\int_{c} \frac{e^{2z}}{(z-1)(z-2)} dz$ where c is the circle	Understand	CAHS004.6
	$ \zeta = 5$ using Cauchy's integral formula.		
4	Determine the value of line integral to $\int_{c} \frac{z^{3}e^{-z}}{(z-1)^{3}} dz$ where c is $ z-1 = \frac{1}{2}$	Understand	CAHS004.6
	using Cauchy's integral formula. $(5z^2 - 3z + 2)$		
5	Determine the value of line integral to $\int_{c} \frac{\int z - Jz + z}{(z-1)^3} dz$ where c is any simple	Understand	CAHS004.6
	closed curve enclosing $ z = 1$ using Cauchy's integral formula.		
6	Estimate the value of line integral to $\int_{z=0}^{z=1+i} [x^2 + 2xy + i(y^2 - z)] dz$ along the curve $y = x^2$.	Understand	CAHS004.5
7	Evaluate $\int_{c} (3z^2 + 2z - 4) dz$ around the square with vertices at (0,0), (1,0),	Remember	CAHS004.5
8	Verify Cauchy's theorem for the function $f(z) = 5 \sin 2z$ if c is the square with vertices at $1 \pm i$ and $-1 \pm i$.	Understand	CAHS004.6
9	Determine the value of line integral to $\int_{C} \frac{(\sin z)^6}{\left(z - \frac{\pi}{6}\right)^3} dz$ around the unit circle	Understand	CAHS004.6
	using Cauchy's integral formula.		
10	Determine the value of to $\int_{c} \frac{e^{zz}}{(z+1)^4} dz$ where c is $ z-1 = 3$ using Cauchy's	Understand	CAHS004.6
	general integral formulae.		

11	Evaluate using cauchy's integral formula $\int_{c} \frac{z+1}{z^2+2z+4} dz$	Understand	CAHS004.6
	Where $c : z+1+i = 2$.		
	Determine the value of line integral to		
12	$\int_{C} \left(y^2 + z^2 \right) dx + \left(z^2 + x^2 \right) dy + \left(x^2 + y^2 \right) dz \text{ from } (0,0,0) \text{ to } (1,1,1) \text{ where C is}$	Understand	CAHS004.5
	the curve $x=t$, $y = t^2$, $z = t^3$ in the parametric form.		
13	Estimate the value of $\int_{c} \frac{e^{z}}{z^{2}(z+1)^{3}} dz$ with C: $ z = 2$ by Cauchy general	Understand	CAHS004.6
	integral formulae. $\int_{B}^{B} g(x) h(x) dx = 1 + \int_{B}^{B} g(x) dx = 1 + \int$		
14	Prove that if $f(z)$ is analytic function then $\int_A f(z) dz$ is independent of path followed.	Remember	CAHS004.5
15	Determine the value of line integral to $\int_0^{3+i} z^2 dz$ along the parabola x=3y ² .	Understand	CAHS004.5
16	Estimate the value of $\int_{C} \frac{1}{e^{z} (z-1)^{3}} dz$ with C: $ z = 2$ by Cauchy general integral formulae	Understand	CAHS004.6
17	Determine the value of $\int_{C} \frac{e^{z} \sin 2z - 1}{z^{2} (z + 2)^{2}} dz$ where c is $ z = \frac{1}{2}$ using Cauchy	Understan d	CAHS004.6
	integral formulae.		
18	Evaluate $\int_{c} \left[\frac{e^{z}}{z^{3}} + \frac{z^{4}}{(z-i)^{2}} \right] dz$, $c: z = 2$ using Cauchy's integral formulae.	Remember	CAHS004.6
19	Determine the value of line integral to $\int_{C} (z^2 + 3z) dz$ along the straight line from (2, 0) to (2, 2) and then from (2, 2) to (0, 2).	Understand	CAHS004.5
20	Let C denote the boundary of a square whose sides lie along the lines $x = \pm 2$ and $y = \pm 2$ where C is described in positive sense. Then determine the value of line integral to $\int_{c} \frac{\cos hz}{z^4} dz$.	Understand	CAHS004.5
	Part - C (Problem Solving and Critical Thinking Question	ons)	
1	Determine the value of line integral to $\int_{c} \frac{z}{(z-1)(z-2)^2} dz$ where c is the	Understand	CAHS004.6
	circle $ z-2 =1/2$ using Cauchy's integral formula.		
2	Estimate the value of line integral to $\int_{c} \frac{z^4}{(z+1)(z-i)^2} dz$ where c is the ellipse	Understand	CAHS004.6
	$9x^2+4y^2=36$ using Cauchy's integral formula.		
3	Estimate the value of line integral to $\int_{c} \frac{z^4 - 3z^2 + 6}{(z+1)^3} dz$ where c is the circle	Understand	CAHS004.6
	z = 2 using Cauchy's integral formula.		
4	Estimate the value of line integral to $\int_{c} \frac{z^2 - 2z - 2}{(z^2 + 1)^2} dz$ where c is the circle	Understand	CAHS004.6

	z-i = 1/2 using Cauchy's integral formula.		
5	Estimate the value of line integral to $\int_{c} \frac{e^{z}}{(z^{2} + \pi^{2})^{2}} dz$ where c is $ z = 4$ using Cauchy's integral formula	Understand	CAHS004.6
6	Estimate the value of line integral to $\int_{c} \frac{\cos \pi z^2}{(z-1)(z-2)^3} dz$ where c is the circle $ z =3$ using Cauchy's integral formula.	Understand	CAHS004.6
7	Determine the value of line integral to $\int_{0}^{1+i} (x - y + ix^2) dz$ i) Along the straight line from $z = 0$ to $z = 1+i$. ii) Along the real axis from $z = 0$ to $z = 1$ and then along a line parallel to imaginary axis from $z = 1$ to $z = 1+i$ iii) Along the imaginary axis from $z = 0$ to $z = i$ and then along a line parallel to real axis $z = i$ to $z = 1+i$.	Understand	CAHS004.5
8	Verify Cauchy's theorem for the integral of $3z^2 + iz - 4$ taken over the boundary of the square with vertices $-1+i$, $-1-i$, $1+i$, $-1-i$.	Understand	CAHS004.6
9	Derive the Cauchy general integral formulae of an analytic function $f(z)$ within a closed contour c.	Remember	CAHS004.6
10	Estimate the value of line integral to $\int_{C} (y^2 + 2xy) dx + (y^2 - 2xy) dy$ where C is the boundary of the region $y = x^2$ and $x = y^2$.	Understand	CAHS004.5
	UNIT-III		
		ION	
	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Ouestions)	ION	
1	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions) State Taylor's theorem of complex power series.	ION Remember	CAHS004.9
1 2	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions) State Taylor's theorem of complex power series. State Laurent's theorem of complex power series.	ION Remember Remember	CAHS004.9 CAHS004.9
1 2 3	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions) State Taylor's theorem of complex power series. State Laurent's theorem of complex power series. Define the term pole of order m of an analytic function f(z).	ION Remember Remember Remember	CAHS004.9 CAHS004.9 CAHS004.11
$ \begin{array}{c} 1\\ 2\\ 3\\ 4 \end{array} $	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions) State Taylor's theorem of complex power series. State Laurent's theorem of complex power series. Define the term pole of order m of an analytic function f(z). Define the terms Essential and Removable singularity of an analytic function f(z).	ION Remember Remember Remember Remember	CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.10
$ \begin{array}{c} 1\\ 2\\ 3\\ 4\\ 5 \end{array} $	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Laurent's theorem of complex power series.Define the term pole of order m of an analytic function $f(z)$.Define the terms Essential and Removable singularity of an analytic function $f(z)$.Expand $f(z) = \frac{1}{z^2}$ in powers of z+1 as a Taylor's series.	Remember Remember Remember Remember Understand	CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.10 CAHS004.9
1 2 3 4 5 6	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Laurent's theorem of complex power series.Define the term pole of order m of an analytic function $f(z)$.Define the terms Essential and Removable singularity of an analytic function $f(z)$.Expand $f(z) = \frac{1}{z^2}$ in powers of z+1 as a Taylor's series.Expand $f(z) = e^z$ as Taylor's series about $z = 1$.	ION Remember Remember Remember Understand	CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.10 CAHS004.9 CAHS004.9
1 2 3 4 5 6 7	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Laurent's theorem of complex power series.Define the term pole of order m of an analytic function f(z).Define the terms Essential and Removable singularity of an analytic function f(z).Expand f(z) = $\frac{1}{z^2}$ in powers of z+1 as a Taylor's series.Expand f(z) = e ^z as Taylor's series about z = 1.Estimate the Poles of $\frac{1}{z^2 - 1}$.	ION Remember Remember Remember Understand Understand	CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.10 CAHS004.9 CAHS004.9 CAHS004.11
1 2 3 4 5 6 7 8	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Laurent's theorem of complex power series.Define the term pole of order m of an analytic function $f(z)$.Define the terms Essential and Removable singularity of an analytic function $f(z)$.Expand $f(z) = \frac{1}{z^2}$ in powers of z+1 as a Taylor's series.Expand $f(z) = e^z$ as Taylor's series about $z = 1$.Estimate the Poles of $\frac{1}{z^2 - 1}$.Obtain the Taylor series expansion of $f(z) = e^z$ about the point $z = 1$.	ION Remember Remember Remember Understand Understand Understand	CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.10 CAHS004.9 CAHS004.9 CAHS004.9
1 2 3 4 5 6 7 8 9	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Laurent's theorem of complex power series.Define the term pole of order m of an analytic function $f(z)$.Define the terms Essential and Removable singularity of an analytic function $f(z)$.Expand $f(z) = \frac{1}{z^2}$ in powers of $z+1$ as a Taylor's series.Expand $f(z) = e^z$ as Taylor's series about $z = 1$.Estimate the Poles of $\frac{1}{z^2-1}$.Obtain the Taylor series expansion of $f(z) = e^z$ about the point $z = 1$.Determine the Poles of the function $f(z) = \frac{ze^z}{(z+2)^4(z-1)}$.	Remember Remember Remember Remember Understand Understand Understand Understand	CAHS004.9 CAHS004.11 CAHS004.10 CAHS004.10 CAHS004.9 CAHS004.9 CAHS004.9 CAHS004.11
1 2 3 4 5 6 7 8 8 9 10	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Laurent's theorem of complex power series.Define the term pole of order m of an analytic function f(z).Define the terms Essential and Removable singularity of an analytic function f(z).Expand f(z) = $\frac{1}{z^2}$ in powers of z+1 as a Taylor's series.Expand f(z) = e ^z as Taylor's series about z = 1.Estimate the Poles of $\frac{1}{z^2-1}$.Obtain the Taylor series expansion of f(z) = e^z about the point z = 1.Define the Isolated singularity of an analytic function f(z).	Remember Remember Remember Remember Understand Understand Understand Understand	CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.10 CAHS004.9 CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.11
1 2 3 4 5 6 7 8 9 10	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Taylor's theorem of complex power series.Define the term pole of order m of an analytic function $f(z)$.Define the terms Essential and Removable singularity of an analytic function $f(z)$.Expand $f(z) = \frac{1}{z^2}$ in powers of $z+1$ as a Taylor's series.Expand $f(z) = e^z$ as Taylor's series about $z = 1$.Estimate the Poles of $\frac{1}{z^2 - 1}$.Obtain the Taylor series expansion of $f(z) = \frac{ze^z}{(z+2)^4(z-1)}$.Define the Isolated singularity of an analytic function $f(z)$.	Remember Remember Remember Remember Understand Understand Understand Understand Understand	CAHS004.9 CAHS004.11 CAHS004.10 CAHS004.10 CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.11
1 2 3 4 5 6 7 8 9 10 11	POWER SERIES EXPANSION OF COMPLEX FUNCT Part - A (Short Answer Questions)State Taylor's theorem of complex power series.State Laurent's theorem of complex power series.Define the term pole of order m of an analytic function $f(z)$.Define the terms Essential and Removable singularity of an analytic function $f(z)$.Expand $f(z) = \frac{1}{z^2}$ in powers of $z+1$ as a Taylor's series.Expand $f(z) = e^z$ as Taylor's series about $z = 1$.Estimate the Poles of $\frac{1}{z^2-1}$.Obtain the Taylor series expansion of $f(z) = e^z$ about the point $z = 1$.Determine the Poles of the function $f(z) = \frac{ze^z}{(z+2)^4(z-1)}$.Determine the Isolated singularity of an analytic function $f(z)$.State Cauchy's Residue theorem of an analytic function $f(z)$ within and on the closed curve.	ION Remember Remember Remember Understand Understand Understand Understand Understand Remember Remember	CAHS004.9 CAHS004.9 CAHS004.10 CAHS004.10 CAHS004.9 CAHS004.9 CAHS004.9 CAHS004.11 CAHS004.11

13	Estimate the Residues of the function $f(z) = \frac{1}{(z - \sin z)}$ about	Understand	CAHS004.9
	z = 0 by Laurent's expansion.		
14	Estimate the Residues of the function $f(z) = \frac{z}{(z+1)(z+2)}$ as a Laurent's series about $z = -2$.	Understand	CAHS004.9
15	Estimate the value of $\oint_C \frac{1-2z}{-(z-1)(z-2)} dz$ by Cauchy's Residue theorem.	Understand	CAHS004.11
16	Determine the Bilinear transformation whose fixed points are i,-i.	Understand	CAHS004.13
17	Obtain the fixed points of the transformation $w = \frac{1}{z - 2i}$	Understand	CAHS004.13
18	Discover the Bilinear transformation which maps the points $(0,-i,-1)$ into the points $(i,1,0)$	Understand	CAHS004.12
19	Discover the points at which $w = \cosh z$ is not conformal.	Understand	CAHS004.12
20	Discuss the fixed points of the transformation $w = \frac{2i - 6z}{iz - 3}$	Understand	CAHS004.13
	Part - B (Long Answer Questions)	I	
1	Expand $f(z) = \frac{z-1}{z+1}$ in Taylor's series about the point $z = 1$.	Understand	CAHS004.9
2	Expand $f(z) = \frac{z-1}{z^2}$ in Taylor's series in powers of z -1. Also determine the	Understand	CAHS004.9
	region of convergence about the point $z = 1$.		
3	Obtain Laurent's series expansion of $f(z) = \frac{z^2 - 4}{z^2 + 5z + 4}$ valid in $1 < z < 4$.	Understand	CAHS004.9
4	Expand $f(z) = \frac{e^{2z}}{(z-1)^3}$ about $z = 1$ as Laurent's series. Also find the region	Understand	CAHS004.9
	of convergence about $z = 1$.		
5	Expand $f(z) = \frac{7z-2}{z(z+1)(z-2)}$ about z=-1 in the region	Understand	CAHS004.9
	1 z+1 < 3 as Laurent's series.		
6	Expand $f(z) = \frac{2z^3 + 1}{z(z+1)}$ in Taylor's series about the point $z = 1$	Understand	CAHS004.9
7	Find Taylor's expansion of $f(z) = \frac{z+1}{(z-3)(z-4)}$ about the point	Understand	CAHS004.9
0	z=2. Determine the region of convergence. Expand $f(z) = \cos z$ in taylor's series shout $z = \pi i$	L'u douatou d	
0	Expand $f(z) = \cos z$ in taylor s series about $z = 2u$.	Understand	
9	Obtain the Laurent's series expansion of $f(z) = \frac{1}{z(1-3z)}$ about $z = 1$.	Understand	CAHS004.9
10	Express $f(z) = \frac{1+2z}{z^2+z^3}$ in a series of positive and negative powers of z.	Understand	CAHS004.9
11	Estimate the value of $\int_{c} \frac{2z-1}{z(2z+1)(z+2)} dz$ where c is the circle	Understand	CAHS004.11
	z = 1.		

12	Assess the value of $\oint_c \tan z dz$ where c is circle $ z = 2$.	Understand	CAHS004.11
13	Estimate the value of $\oint_c \frac{dz}{(z^2+4)^2}$ where c is $ z-i = 2$.	Understand	CAHS004.11
14	Calculate the value of $\oint_c \frac{\coth z}{z-i} dz$ where c is $ z = 2$.	Understand	CAHS004.11
15	Calculate the value of $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2 + 1)(x^2 + 4)}$	Understand	CAHS004.11
16	Determine the Bi-linear transformation which carries the points from $(0,1,\infty)to(-5,-1,3)$.	Understand	CAHS004.12
17	Determine the Bi-linear transformation which carries the points from $(1, i, -1)to(0, 1, \infty)$.	Understand	CAHS004.12
18	Determine the Bilinear transformation that maps the points $(1-2i, 2+i, 2+3i)$ into the points $(2+i, 1+3i, 4)$.	Understand	CAHS004.12
19	Determine the Bilinear transformation that maps the points $(1, i, -1)$ into the points $(2, i, -2)$.	Understand	CAHS004.12
20	Determine the Bilinear transformation that maps the points $(\infty, i, 0)$ into the points $(0, i, \infty)$.	Remember	CAHS004.12
	Part - C (Problem Solving and Critical Thinking Questio	ns)	_
1	Obtain the Laurent expansion of $f(z) = \frac{1}{z^2 - 4z + 3}$ for $1 < z < 3$ (ii) $ z < 1$ (iii) $ z > 3$	Understand	CAHS004.9
2	Expand $f(z) = \frac{(z-2)(z+2)}{(z+1)(z+4)}$ in the region where $(i) z < 1$ (ii) $1 < z < 4$.	Understand	CAHS004.9
3	Expand $\frac{1}{z^2(z-3)^2}$ as Laurent's series in the region $(i) z < 1$ (ii) z > 3.	Understand	CAHS004.9
4	Expand $f(z) = \frac{2}{(2z+1)^3}$ in Taylor's series about z=0 and z=2.	Understand	CAHS004.9
5	Expand $f(z) = \frac{e^z}{z(z+1)}$ in Taylor's series about z=2.	Understand	CAHS004.9
6	Determine the value of $\oint_c \frac{z-3}{(z^2+2z+5)} dz$ where c is circle $ z = 1$.	Understand	CAHS004.10
7	Estimate the value of $\int_{0}^{2\pi} \frac{d\theta}{a + b\cos\theta}$	Remember	CAHS004.10
8	Discover the Bilinear transformation that maps the points $(0,1,\infty)$ into the points $(-1,-2,-i)$.	Understand	CAHS004.12
9	Obtain the fixed points of the transformation $w = \frac{3iz + 13}{z - 3i}$	Understand	CAHS004.13
10	Determine the Bilinear transformation that maps the points $(\infty, i, 0)$ in the z-plane into the points $(0, i, \infty)$ in the w-plane.	Understand	CAHS004.12

UNIT-IV									
SINGLE RANDOM VARIABLES									
Part - A (Short Answer Questions)									
1	Define the discrete an	with a suitable example.	Remember	CAHS004.15					
2	List the important Pro	Remember	CAHS004.15						
3	Obtain the probabilit coins.	Remember	CAHS004.15						
4	Define the term ma function.	Remember	CAHS004.16						
5	If X is discrete random Variance of $(aX + b)$	Remember	CAHS004.16						
6	Define the term proba	ability mass	s funct	ion of	a probab	oility distribution.	Remember	CAHS004.15	
7	If X denote random v constant.	variable, pi	ove th	nat E[X	$K-K\} = I$	E{X] - K where 'K' is a	Remember	CAHS004.16	
7	If X denote random v	variable, Pı	rove th	at E[X	K+K] = I	E[X] + K where 'K' is a	Remember	CAHS004.16	
8	List the important pro	perties of	probal	oility r	nass fund	ction.	Remember	CAHS004.15	
9	Explain the term Mor	nent genera	ating f	unction	n of a pr	obability distribution.	Remember	CHS004.17	
10	Express the relation function of a random	between th variable.	e prob	ability	density	and cumulative density	Remember	CAHS004.15	
11	Define the term Mear	and Varia	nce of	a prob	ability r	nass function.	Remember	CAHS004.16	
12	Define the term Mear	n and Varia	nce of	a prot	ability d	lensity function.	Remember	CAHS004.16	
13	Define the term proba	ability dens	ity fur	nction	of a prob	ability distribution.	Understand	CAHS004.15	
14	Define the moments f	or distribu	tion.		•	¥	Understand	CAHS004.17	
15	Obtain the first 4 mor	nents for th	ne set o	of num	bers 2, 4	, 6 and 8.	Understand	CAHS004.17	
16	A die is thrown at ran The probability densit	Understand	CAHS004.15						
17	$f(x) = \frac{1}{2} \exp\left[-\frac{x}{2}\right],$ <2.	Understand	CAHS004.16						
18	Probability density fu $f(x) = \begin{cases} \frac{sinx}{2} \\ 0, elsewhere \end{cases}$ X.	Understand	CAHS004.16						
19	A continuous random $f(x) = \begin{cases} kxe^{-\lambda x}, \text{ for} \\ 0, \text{ otherwis} \end{cases}$ Determine the value of	Remember	CAHS004.16						
20	Obtain the value of random variable X w $f(x) = \begin{cases} \frac{\sin x}{2} \\ 0, elsewhere \end{cases}$	Understand	CAHS004.16						
Part - B (Long Answer Questions)									
	A random variable x	nction:							
1	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c} 3 & 4 \\ 2k & 2k \end{array}$	5 3k	$\frac{6}{k^2}$	$\frac{7}{7k^2+k}$		Understand	CAHS004.16	

	Find (i) k (ii) P(x<6) (iii) p(x>6)					
	Let X denotes the minimum of the two numbers that appear when a pair of					
2	fair dice is thrown once. Find	Understand	CAHS004.16			
	(i)Discrete probability distribution (ii) Expectation (iii) Variance					
	A random variable X has the following probability function					
2	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	TT 1 / 1				
3	P(X = 0.1 = K = 0.2 = 2K = 0.3 = K	Understand	CAHS004.16			
	Coloulate (i) $k_{\rm c}$ (ii) mean (iii) verience (iv) $\mathbf{P}(0 < \mathbf{v} < 2)$					
	Calculate (1) K (11) mean (11) variance (1v) $F(0 < x < 5)$					
	A continuous function variable has the probability density function $\begin{pmatrix} 1 & -\lambda x \\ -\lambda x & 0 \end{pmatrix} > 0$					
4	$f(x) = \begin{cases} kxe & , \text{ for } x \ge 0, \lambda > 0 \end{cases}$	Understand	CAHS004.16			
	0, otherwise					
	Determine(i) k (ii) Mean (iii) Variance					
	If the Probability density function of random variable is					
5	$f(x) = k(1-x^2), 0 < x < 1$ then Calculate	Understand	CAHS004.16			
	(i) k (ii) $p(0.1 < x < 0.2)$ (iii) $P(x > 0.5)$					
6	Two coins are simultaneously ,Let X denotes the number of heads then find	Understand	CAUS004 15			
0	expectation of X and variance of X.	Understand	CAII5004.15			
	If the Probability density function of a random variable is					
7	$f(x) = k(1+x^2), 0 < x < 2$ then Calculate	Understand	CAHS004.16			
	(i) k (ii) $P(0.2 < x < 0.3)$ (iii) $P(x > 0.7)$					
0	If a random variable X has the moment generating function is given by $M(t) =$	I Indoneton d	CAUS004 17			
8	$\frac{2}{2-t}$, find the variance of X.	Understand	CAH5004.17			
0	Let X be the random variable of the following values $x=1,2,3$ if $f(x) = x/6$.	TTo do not on d				
9	Then find mean and variance.	Understand	CAH5004.16			
	Obtain the moment generating function of a random variable X having the					
10	$(x, 0 \le x < 1)$	Understand	CAHS004.17			
	probability density function $f(x) = \{2 - x, 1 \le x < 2$					
11	List the relation between moment about mean and moment about origin	Understand	CAHS004 17			
11	List the relation between moment about mean and moment about origin. $(0 - x < 2)$	Understand	CAII5004.17			
	0, x < 2					
	Is the function defined by $f(x) = \begin{cases} \frac{1}{10}(2x+3), & 2 \le x \le 4 \end{cases}$ a probability					
12	18 0 $r > 4$	Remember	CAHS004.16			
	0 , <i>x</i> > 4					
	density function? Find the probability that a variate having $f(x)$ as density					
10	function will fall in the interval $2 \le x \le 3$.	D 1	G 4 1 1 G 0 0 4 1 5			
13	$\frac{\text{If } E(X) = 10, v(x) = 1 \text{ then find } E[2x (x+20)].}{\sum_{x \in A} \frac{1}{x} \sum_{x $	Remember	CAHS004.15			
14	Find the probability distribution for sum of scores on dice if we throw two	Understand	CAHS004.15			
	A discrete random variable X has the following probability distribution					
	A discrete random variable A has the following probability distribution					
	X 1 2 3 4 5 6 7 8					
15	P(X=x 2k 4k 6k 8k 10k 12k 14k 4k	Understand	CAHS004.16			
	Find (i) k (ii) $p(X < 3)$ (iii) $p(X \ge 5)$					
1.5	Let X be a random variable which can take on the values 1, 2 and 3 with	TT 1 · ·				
16	probabilities 1/3, 1/6 and 1/2. Calculate the third moment about mean.	Understand	CAHS004.17			
17	A random variable has the probability density function $c_{1} = \frac{2}{3}$	Understand	CAHS004.17			
	$f(x) = x^2, 1 \le x \le 2$					

	Find its moment generating function.											
18	The density function of a random variable X is $f(x) = \begin{cases} e^{-x} , x \ge 0 \\ 0 , otherwise \end{cases}$ Find E(X), E(X ²), V(X).								Understand	CAHS004.16		
	Find $E(X)$, $E(X^{-})$, $V(X)$. Compute the first four moments about the mean for the following distribution											
	N	larks	0-	10-	20-	30-	40-	50-	60-			
19			10	20	30	40	50	60	70	_	Understand	CAHS004.17
	N st	o. of udents	8	12	20	30	15	10	5			
	Also find the values of β_1 and β_2 .											
20	Dete f(x)	$rmine th = Ax^2 in$	ne valu n 0 < x	e of A to < 1	the pro	obability	density	function function	n		Understand	CAHS004.16
			I	Part - C	(Proble	m Solvi	ng and	Critica	l Thin	king Questio	ons)	
	Find	the Me	an and	Varianc	e to the	followi	ing disc	rete dist	ributio	n		
1	X Y	8	12 1/6	16 3/8	$\begin{array}{c c} 20 & 2 \\ \hline 1/4 & 1 \end{array}$	4/2					Understand	CAHS004.16
	A rai	ndom va	riable	X has th	e follow	- ving prob	ability	function	1.			
							· ···· ··· · · · · · · · · · · · · · ·					
_	X	4	5	6	8							
2	PΩ	X 0.1	0.3	0.4	0.2						Understand	CAHS004.16
	Ì											
	Dete	rmine (i) Expe	ctation (ii) varia	nce (iii)	Standar	d deviat	ion.			
	Out	of 24 m	angoe	s, 6 mar	ngoes ar	e rotten	. If we	e draw t	wo m	angoes, then		
3	obtai	n proba	ability	distribu	tion of	number	of rot	ten ma	ngoes	that can be	Remember	CAHS004.15
	drawn.											
	If X is a Continuous random variable whose density function is											
	$(x if \ 0 < x < 1)$											
4			j	f(x) =	${2-x}$	if 1 <u>:</u>	$\leq x < x$	2			Understand	CAHS004.16
	D' 1	D () F V	2 . 00		(0		elsewhere					
	Find	E(25X)	<u>² + 30</u>	1000000000000000000000000000000000000		1	• 1	1 17'				
5	The probability density function of a random variable X is K									Understand	CAHS004 16	
5	f(x)	$=\frac{\pi}{x^2+1}$, –∞	< x <	∞ . Find	l K and	the dist	ribution	function	on $F(x)$.	Chaelstand	C/110004.10
	If the probability density of a random variable X is given											
	$\int \frac{k(1-x^2)}{2} 0 < x < 1$											
6	by f	$f(x) = \{$	0 -	.),0 .1	F	ind (i)	k (ii) 7	The curr	ulativ	e distribution	Understand	CAHS004 16
0	U, otherwise									Onderstand	C/115004.10	
	funct	ion										
	of X.	~ 1										
7	The	first thre	e mon	ients of a	a distrib	ution ab	out the	value 2	of the	variable	Understand	CAHS004.17
	are I,	16, and	<u>-40. S</u>	how that	t the me	an = 3, t	the varia	$\frac{\text{nce} = 1}{c}$	$\frac{5 \text{ and}}{1000}$	$\mu_3 = -86.$	D 1	GAUG004.17
8	Expl	ain mon	ients a	t origin (or a prot	bability of	uistribut	tion fund	cuon.	·	Remember	CAHS004.17
9	Expl	ain the f	nomen	i genera	ung run	cuon of	a proba	bility di	stribut	of manual	Kemember	CAH5004.17
10	Expl bout	ann the l	cialioi	i Detwee	in the m	ioments	about r	nean m	terms	or moments	Remember	CAHS004.17
					PR	OBARI		ISTRI	RITT	ONS		
Part - A (Short Answer Questions)												
1	Defi	ne the te	rms m	an vari	ance of	Binomia	al distril	nution	acout		Remember	CAHS004 19
2	Draft the recurrence relation for the Binomial distribution									Remember	CAHS004.19	
<u> </u>	Drait the recurrence relation for the Dinomial distribution. Remember CARS004.1											

3	Define the term mode of a Binomial distribution.	Remember	CAHS004.19
4	Determine the value of n if the mean and variance of a Binomial distribution are 3 and 9/4.	Understand	CAHS004.19
5	Determine the Binomial distribution for which the mean is 4 and variance 3	Understand	CAHS004.19
6	The mean and variance of a binomial variable X with parameters n and p are 16 and 24.Determine the value of $P(X=1)$.	Remember	CAHS004.19
7	If a bank received on the average 6 bad cheques per day, Find the probability that it will receive 4 bad cheques on any given day.	Understand	CAHS004.19
8	Define the terms Mean, Variance of Poisson distribution	Remember	CAHS004.19
9	If X is a Poisson variate with $P(x=2) = 2/3P(x=1)$ Compute the value of $P(x=0)$.	Understand	CAHS004.19
10	Draft the recurrence relation for the Poisson distribution.	Remember	CAHS004.19
11	The mean and variance of binomial distribution are 4 and 4/3 respectively. Find $p(X \ge 1)$.	Remember	CAHS004.19
12	If a bank received on the average 6 bad apples per day then estimate the probability that it will receive 4 bad cheques on any given day.	Understand	CAHS004.19
13	If 2% of light bulbs are defective in a sample of 100.Find at least one is defective.	Remember	CAHS004.19
14	If a random variable has Poisson distribution such that $p(1) = p(2)$. Determine the value of $p(1 < x < 4)$.	Understand	CAHS004.19
15	Define Poisson distribution.	Remember	CAHS004.19
16	Define the term Normal Distribution.	Remember	CAHS004.20
17	Define Binomial distribution.	Remember	CAHS004.20
18	Define Normal curve.	Remember	CAHS004.20
19	Draft the applications of Normal distribution.	Remember	CAHS004.20
20	If X is Normally distributed with mean 2 and variance 0.1, then Estimate the value of $P(x-2 \ge 0.01)$	Understand	CAHS004.20
Part ·	B (Long Answer Ouestions)		
1	Derive the Variance of a Binomial Distribution.	Remember	CAHS004.19
	Estimate the probability that at most 5 defective components will be found in		
2	a lot of 200. Experience shows that 2% of such components are defective. Also find the probability of more than 5 defective components.	Understand	CAHS004.19
	The probability that a man hitting a target is $1/3$. If he fires 5 times,		
3	Determine the probability that he fires	Understand	CAHS004.19
	(i) At most 5 times (ii) At least 2 times		
4	Find the variance of a Poisson Distribution.	Remember	CAHS004.19
5	Poisson variate has a double mode at x=2 and x=3, Determine the maximum probability and also find $p(x \ge 2)$	Understand	CAHS004.19
6	Average number of accidents on any day on a national highway is 1.8. Determine the probability that the number of accidents is (i) at least one (ii) at most one	Understand	CAHS004.19
7	A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed to Poisson distribution with mean 1.5. Find the proportion of days (i)on which there is no demand (ii)on which demand is refused.	Understand	CAHS004.19
8	If x is a poisson variate such that $p(x=2)=45p(x=6)-3p(x=4)$. Find (i) $p(x \ge 1)$ (ii) $p(x<2)$	Remember	CAHS004.20
0	Derive median of the Normal distribution.	Remember	CAHS004.20

10	Explain the variance of a Normal Distribution.	Remember	CAHS004.20
11	Explain the mode of Normal distribution.	Remember	CAHS004.20
12	Prove that mean deviation from the mean for Normal distribution is $\frac{4\sigma}{5}$	Remember	CAHS004.20
13	Prove that poisson distribution is limiting case of binomial distribution .	Remember	CAHS004.20
14	If the masses of 300 students are normally distributed with mean 68 kg and standard deviation 3 kg how many number of students have masses: greater than 72 kg (ii) less than or equal to 64 kg (iii) between 65 and 71 kg inclusive	Understand	CAHS004.20
15	In a Normal distribution, 7% of the item are under 35 and 89% are under 63. Compute the mean and standard deviation of the distribution	Understand	CAHS004.20
16	It has been found that 2% of the tools produced by a certain machine are defective. Estimate the probability that in a shipment of 400 such tools, i) 3% or more ii) 2% are less will prove defective.	Understand	CAHS004.20
17	In a Normal distribution, 31% of the items are under 45 and 8% are over 64. Estimate the mean and variance of the distribution.	Understand	CAHS004.20
18	If X is a Normal variate then determine the area A. i) to the left of $z = -1.78$ ii) to the right of $z = -1.45$ iii) corresponding to $-0.8 \le z \le 1.53$ iv) to the left of $z = -2.52$ and the right of 1.83. Show the above by graphs.	Understand	CAHS004.20
19	1000 students have written an examination with the mean of test is 35 and standard deviation is 5. Assuming the distribution to be normal find i) How many students marks like between 25 and 40? ii) How many students get more than 40? iii) How many students get below 20? iv) How many students get more than 50.	Understand	CAHS004.20
20	The mean height of students in a college is 155cm and standard deviation is 15. Estimate the probability that mean height of 36 students is less than 157cm.	Understand	CAHS004.20
	Part - C (Problem Solving and Critical Thinking Questio	ns)	
	Fit a Binomial Distribution to the following data		
1	x 0 1 2 3 4 5 6 7 f 305 365 210 80 28 9 2 1	Remember	CAHS004.19
2	It has been claimed that in 60% of all solar heat installations that utility bill is reduced by atleast one –third .Accordingly, What are the probabilities that the utility bill will be reduced by at least one –third in (i) four or five installations (ii) at least four of five installations.	Understand	CAHS004.19
3	Fit a Binomial Distribution to the following data x 012345f2142034228	Understand	CAHS004.19
4	Show that the mean, mode and median are equal in poisson distribution.	Remember	CAHS004.19
5	Derive mean of the Normal distribution.	Understand	CAHS004.19
6	Show that the recurrence relation for the Poisson distribution is $P(x) = \frac{\lambda}{x} \cdot P(x-1)$		CAHS004.19
7	The marks obtained in statistics in a certain examination found to be normally distributed. If 15% of the students greater than or equal to 60 marks ,40% less than 30 marks. Find the mean and standard detion.	Understand	CAHS004.19
8	The life of electronic tubes of a certain types may be assumed to be normal distributed with mean 155 hours and standard deviation 19 hours. Determine the probability that the life of a randomly chosen tube (i) is between 136 hours and 174 hours.	Understand	CAHS004.19

	(ii) less than 117 hours		
	(iii) will be more than 395 hours		
9	Derive the mean of the Binomial Distribution.	Remember	CAHS004.20
10	The marks obtained in mathematics by 1000 students are Normally		
	distributed with mean 78% and standard deviation 11%. Determine		
	(i)How many students got marks above 90% marks	Understand	CAHS004.20
	(ii)What was the highest mark obtained by the lowest 10% of the students		
	(iii)Within what limits did the middle of 90% of the student lie.		

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HOD, FRESHMAN ENGINEERING