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Lecture Plan 1

Semester:-III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	**Topic:-** Introduction of syllabus & some trigonometric formulae .Important integra odd functions**.**	**Time Allotted:-**
1.	Introduction:- • A function f(x) is said to be even if f(-x) = f(x), for e.g. cosx, x^2,secx etc. Graphically an even function is symmetrical about the y-axis. • A function f(x) is said to be odd if f (-x) = - f(x), for e.g. sinx, x^3,tanx etc. Graphically an odd function is symmetrical about the origin.	10Minutes
2	Division of the Topic:- • Define even and odd functions. • Method of Fourier expansions for even and odd functions.	20Minutes
3.	Conclusion :- • When f(x) is an even function, then b_n= 0. • When f(x) is an odd function, then a_0=0 and a_n=0. • $\int_{-c}^{c} f(x)\,dx = 2\int_0^c f(x)\,dx$, When f(x) is an even function. = 0 , When f(x) is an odd function.	05Minutes
4	Question / Answer :- • Find the Fourier series to represent the function f(x) = $\vert\sin x\vert$, $-\pi<x<\pi$. • Expand the function f(x) = x sinx as a Fourier series in the interval $-\pi<x<\pi$.	15Minutes

Assignment to be given:-(i) A function is defined as follows:

$$f(x) = -x \text{ when } -\pi < x < 0$$
$$= x \text{ when } 0 < x < \pi$$

Show that $f(x) = \pi / 2 - 4/\pi[\cos x/1^2 + \cos 3x/3^2 + \cos 5x/5^2 + \text{---------}]$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.384-386)

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Lecture Plan 2

Semester:-III Class:- EEE
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	Topic:-Fourier Series–Euler's Formulae &Conditions For a Fourier Expansion.	Time Allotted:-
1.	Introduction:- • In the study of periodic Phenomena in conduction of heat , electro-dynamic and acoustics, it is necessary to express a function in a series of sines and cosines. Most of the single – valued functions which occur in applied mathematics can be express in the form $a_0/2 + a_1\cos x + a_2\cos 2x + ---------- + b_1\sin x + b_2\sin 2x + -------------$ Such a series is known as the Fourier series.	05minutes
2	Division of the Topic:- • Define Euler's formulae. • Conditions for a Fourier Expansion.	20 minutes
3.	Conclusion :- • The Fourier series for the function f(x) in the interval $\alpha < x < \alpha+2\pi$ is given by $f(x) = a_0/2 + \Sigma a_n\cos nx + \Sigma b_n\sin nx$ • For a Fourier series f(x) is periodic, single-valued and finite.	05 minutes
4	Question / Answer :- • Expand $f(x) = x\sin x,\ 0 < x < 2\pi$, in a Fourier series. • Prove that $x^2 = \pi^2/3 + 4\Sigma(-1)^n\cos nx/n^2$, $-\pi < x < \pi$	20 minutes

Assignment to be given:- Obtain a Fourier series to represent e-ax from $x = -\pi$ to $x = \pi$. Hence derive series for $\pi/\sinh\pi$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.375-379)

Lecture Plan 3

Semester:-III Class:- EEE
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	Topic:- Functions having points of discontinuity .	Time Allotted:-
1.	Introduction:- • If a function having a number of finite discontinuity in the interval $(\alpha , \alpha + 2\pi)$, then f(x) is defined as $f(x) = \phi(x)$, $\alpha < x < c$ $= \psi(x)$, $c < x < \alpha + 2\pi$, i.e. c is the point of discontinuity • In the case of change of interval, the period of the function required to be expanded is not 2π but some other interval 2c.	10 Minutes
2	Division of the Topic:- • Define the functions having points of discontinuity. • Define the change of interval.	20 Minutes
3.	Conclusion :- • In case of points of discontinuity, the value of function at x = c is defined as $f(x) = ½ [f(c - 0) + f(c + 0)]$ • In case of change of interval, the Fourier series of the function f(x) in the interval $(\alpha , \alpha + 2c)$ is given by $f(x) = a_0 / 2 + \sum a_n \cos (n\pi x / c) + \sum b_n \sin(n\pi x / c)$	05 Minutes
4	Question / Answer :- • Find the Fourier series of the function $f(x) = x^2$ for 0 to π $= - x^2$ for $-\pi$ to 0 • Find the Fourier series to represent x^2 in the interval (-l , l)	15 Minutes

Assignment to be given:- (i) Find the Fourier series of the function f(x), if
$f(x) = x$ for 0 to π
$= -\pi$ for $-\pi$ to 0
(ii) Find a Fourier series for $f(t) = 1 – t^2$ when t is -1 to 1

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.380-383)

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Lecture Plan 4

Semester:-III　　Class:- EEE
Course Code :- Math-201- F　　Subject:- Mathematics　　Unit:- I

S. No.	Topic:- , change of interval.	Time Allotted:-
1.	Introduction:- • • In the case of change of interval, the period of the function required to be expanded is not 2π but some other interval 2c.	10 Minutes
2	Division of the Topic:- • • Define the change of interval.	20 Minutes
3.	Conclusion :- • In case of points of discontinuity, the value of function at x = c is defined as $f(x) = \frac{1}{2}[f(c - 0) + f(c + 0)]$ • In case of change of interval, the Fourier series of the function f(x) in the interval $(\alpha , \alpha + 2c)$ is given by $f(x) = a_0 / 2 + \sum a_n \cos (n\pi x / c) + \sum b_n \sin(n\pi x / c)$	05 Minutes
4	Question / Answer :- • Find the Fourier series of the function $f(x) = x^2$ for 0 to π $= - x^2$ for $-\pi$ to 0 • Find the Fourier series to represent x^2 in the interval (-l , l)	15 Minutes

Assignment to be given:- (i) Find the Fourier series of the function f(x), if
$f(x) = x$ for 0 to π
$= -\pi$ for $-\pi$ to 0
(ii) Find a Fourier series for $f(t) = 1 – t^2$ when t is -1 to 1

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.380-383)

Lecture Plan 5

Semester:-III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	Topic:- Half range sine and cosine series.	Time Allotted:-
1.	Introduction:- • If it is required to expand f(x) in the interval (0 , l), then it is immaterial what the function may be outside the range $0 < x < l$. We are free to choose it arbitrarily in the interval (- l , 0)	10Minutes
2	Division of the Topic:- • Half range sine series. • Half range cosine series.	20Minutes
3.	Conclusion :- • For sine series , we have to find the value of b_n. • For cosine series , we have to find the value of a_0 and a_n.	05Minutes
4	Question / Answer :- • Obtain the half range sine series for e^x in $0 < x < 1$ • Obtain a half range cosine series for $f(x) = kx \quad \text{for} \quad 0 \le x \le l/2$ $\quad = k(l - x) \quad \text{for} \quad l/2 \le x \le l$ Deduce the sum of the series $1/1^2 + 1/2^2 + 1/5^2 +$ -------------	15Minutes

Assignment to be given:- Find half range cosine series for the function $f(x) = x^2$ in the range $0 \le x \le \pi$
Express $f(x) = x$ as a half range sine series in $1 < x < 2$
Find half range sine series for the function $f(t) = t - t^2$, $0 < t < 1$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.389-390)

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Lecture Plan 6

Semester:-III   Class:- EEE.
Course Code :- Math-201- F   Subject:- Mathematics   Unit:- I

S. No.	**Topic:- Fourier expansion of square , rectangular and saw toothed wave. :- Fo half and full rectified wave functions**	**Time Allotted:-**
1.	Introduction: • A periodic wave form is a wave form that repeats a basic pattern. It is a single-valued periodic function. Therefore it can be developed as a Fourier series.	10Minutes
2	Division of the Topic:- • Fourier series of a square wave function. • Fourier series of a rectangular wave function. • Fourier series of saw-toothed wave. Define half and full rectified wave functions. • Fourier expansion of half and full rectified wave functions. •	20Minutes
3.	Conclusion :- • All these functions are the periodic functions. • We have to draw the graph of all these wave functions.	05Minutes
4	Question / Answer :- Find the Fourier expansion of the following functions • $f(x) = -k$, for $-\pi < x < 0$ $= k$, for $0 < x < \pi$ • $f(x) = 1$, for $0 < x < \pi$, $f(x + 2\pi) = f(x)$ $= 0$, for $\pi < x < 2\pi$ • $f(x) = x$, for $-\pi < x < \pi$ and $f(x + 2\pi) = f(x)$	15Minutes

Assignment to be given:- Draw the graph of square , rectangular and saw toothed wave. Also find the Fourier expansion of these wave functions. Draw the graph of half and full rectified wave functions. Also find the Fourier expansion of these wave functions.

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.392-393)

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Lecture Plan 7

Semester:-III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	**Topic :-** Fourier transforms: complex transform. Sine transform , cosine transform.	**Time Allotted:-**
1.	Introduction:- The integral transform of a function f(x) is defined by the equation $I\{f(x)\} = F(s) = \int_a^b f(x)\, K(s,x)\, dx$, where K(s,x) is a known function of s and x, is called the Kernel of the transform; s is called the parameter of the transform and f(x) is called the inverse transform of F(s). When $K(s,x) = e^{isx}$, we have the Fourier transform of f(x). thus $F(s) = \int_{-\infty}^{\infty} e^{isx} f(x)\, dx$	10Minutes
2	Division of the Topic:- • Definition of Fourier Transform. • Fourier integral theorem. • Fourier sine and cosine transform.	20Minutes
3.	Conclusion :- • K(s,x) is known as the Kernel of the transform • Fourier transform of the function f(x) is always a function of s. • Fourier transform of the function f(x) is denoted by F(s). • Fourier sine and cosine transforms are denoted by $F_s(s)$ and $F_c(s)$ respectively.	05Minutes
4	Question / Answer :- • What is the definition of Fourier Transform. • What is the definition of Fourier sine and cosineTransform.	15Minutes

Assignment to be given :- Express the function $f(x) = 1$ for $|x| \le 1$ as a Fourier integral.
$= 0$ for $|x| \ge 1$

Hence evaluate $\int_0^{\infty} \sin \lambda x \cos \lambda x / \lambda \, d\lambda$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P. 713-717)

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Lecture Plan 8

Semester:-III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	Topic :- Inverse Fourier transforms: complex , Sine, Cosine Inverse Transform	Time Allotted:-
1.	Introduction:- The integral transform of a function f(x) is defined by the equation $I\{f(x)\}= F(s) = \int_a^b f(x)\, K(s,x)\, dx$, where K(s,x) is a known function of s and x, is called the Kernel of the transform; s is called the parameter of the transform and f(x) is called the inverse transform of F(s). When $K(s,x) = e^{isx}$, we have the Fourier transform of f(x). thus $F(s) = \int_{-\infty}^{\infty} e^{isx} f(x)\, dx$	10Minutes
2	Division of the Topic:- • Definition of Fourier Transform. And its inverse. • Fourier sine and cosine transform& their inverse .	10Minutes
3.	Conclusion :- • Fourier transform of the function f(x) is denoted by F(s). • Fourier sine and cosine transforms are denoted by $F_s(s)$ and $F_c(s)$ respectively. • Inverse is denoted by f(x)	05Minutes
4	Question / Answer :- • What is the definition of Fourier Transform & its inverse • What is the definition of Fourier sine and cosine Transform & their inverse. • Problems on these topics were done	25inutes

Assignment to be given :- find the fourier transform of function $f(x) = 1-x^2$ for $|x| \leq 1$
$= 0$ for $|x| \geq 1$
Hence evaluate $\int_0^{\infty} (\cos x-\sin x)/x^3 \cos(x/2)dx$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P. 713-717)

Lecture Plan 9

Semester:-III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	Topic :- Properties of Fourier transform , Convolution theorem	Time Allotted:-
1.	Introduction :- If F(S) is the complex Fourier transform of f(x), then $F[\ f(x-a)] = e^{i\,a\,s}\ F(s)$ If F(s) is the complex Fourier transform of F(t) and t_0 is any real number, then $F[\ f(t-t_0)] = e^{i\,st}\ F(s)$. This is known as Shifting on Time axis. If F(s) is the complex Fourier transform of F(t) and s_0 is any real number, then $F[\ e^{i\,st} f(t)\ ] = F(s + s_0)$. This is known as Shifting on Frequency axis. :- The convolution of two functions f(x) and g(x) over the interval $(-\infty ,\infty)$ is defined as $f(x) * g(x) = \int_{-\infty}^{\infty} f(u)\ g(t-u)\ du$	10Minutes
2	Division of the Topic:- • Shifting Property. • Shifting on time axis and on frequency axis. • Fourier transforms of the Derivatives of a function. • Fourier sine and cosine transforms of $\partial^2 u / \partial x^2$.	20Minutes
3.	Conclusion :- • There are Linear property, Change of scale property, Shifting property and Modulation theorem in Fourier transform as in Laplace transform. • We have to also find the Fourier transform of derivatives as in Laplace transform. For the Convolution theorem for Fourier transforms we use the definition of convolution of two functions	05Minutes
4	• Question / Answer :- What is the convolution of two functions. State and prove the convolution theorem • Find the Fourier transform of $f(x) = 1 - x^2$, if $\lvert x \rvert < 1$ $= 0$, if $\lvert x \rvert > 1$ And use it to evaluate $\int_0^{\infty} (\ x \cos x - \sin x\ ) / x^3 \cos x/2\ dx$ • Find the Fourier sine transform of $e^{-\,a\,x} / x$ • Find the Fourier cosine transform of e^{-x2}	15Minutes

Assignment to be given :- Find the Fourier transform of the function

$$f(x) = 1\ ,\quad \lvert x \rvert < a \qquad \text{Hence evaluate } \int_0^{\infty} \sin x / x\ dx$$
$$= 0\ ,\quad \lvert x \rvert > a$$

Find the sine and cosine transform of the function $e^{-\,a\,x}$, $a > 0$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.717,725)

Lecture Plan 10

Doc. No.: DCE/0/03
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Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	Topic :- Parseval's identities for complex , Sine & Cosine transforms	Time Allotted:-
1.	Introduction : Define Parseval's identities for complex , Sine & Cosine transforms	10Minutes
2	Division of the Topic:- Parseval's identities for complex transform Sine transform Cosine transforms	20Minutes
3.	Conclusion :-	05Minutes
4	• Question / Answer :- • Question on parseval identity	15Minutes

Assignment to be given

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.717,725)

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Lecture Plan 11

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- I

S. No.	Topic :- Fourier transform of integrals,	Time Allotted:-
1.	Introduction :- Let f(t) be piecewise continuous on every interval [-l , l] and $\int_{-\infty}^{\infty} \mid f(t) \mid dt$ converge. Let F[f(t)] = F(s) satisfies F(0) = 0. Then $F[\int_{-\infty}^{t} f(T)\, d T] = 1 / is\, F(s)$	10Minutes
2	Division of the Topic:- • Fourier transform of integrals. • To evaluate the integral equation by Fourier transform.	20Minutes
3.	Conclusion :- • we can solve the definite integral by Fourier transform • We can solve the integral equation by Fourier transform.	05Minutes
4	Question / Answer :- • Solve the integral equation $\int_0^{\infty} f(x) \cos px\, dx = 1 - p , \quad 0 \le p \le 1$; $= 0 , \quad p > 1$ • Solve the integral equation $\int_0^{\infty} f(x) \sin\lambda x\, dx = 1 - \lambda , \quad 0 \le \lambda \le 1$; $= 0 , \quad \lambda \ge 1$	15Minutes

Assignment to be given :- Solve

$$\int_0^{\infty} f(x) \sin tx\, dx = \begin{cases} 1 , & 0 \le t \le 1 \\ 2 , & 1 \le t < 2 \\ 0 , & \lambda \ge 2 \end{cases}$$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal P(721)

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Lecture Plan 12

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	**Topic :- Definition of a Functions of a complex variable, exponential and trigonometric functions.**	**Time Allotted:-**
1.	Introduction :- If x and y are real numbers, then $z = x + iy$ is called a **complex variable.** If corresponding to each value of a complex variable z ($= x + iy$) in a given region R, there correspond one or more values of another complex variable $w = (u + iv)$, then w is called a function of the complex variable z and is denoted by $w = f(z) = u + iv$ where u is the real part and v is the imaginary part of w.	5 Minutes
2	Division of the Topic:- • Definition of a Complex variable function. • Exponential function of a complex variable. • Trigonometric function of a complex variable.	20 Minutes
3.	Conclusion :- • A complex variable function is denoted by w or f(z). • u , v are the real and imaginary parts of a complex function. • The exponential function e^z is a periodic function with period $2\pi i$ • For all values of θ , real or complex , $e^{i\theta} = \cos\theta + i \sin\theta$	5 Minutes
4	Question / Answer :- • Split up into real and imaginary parts of $e^{5 + \frac{1}{2} i \pi}$ • Find all the values of z which satisfy $e^z = 1 + i$ • State and prove the trigonometric identities.	20 Minutes

Assignment to be given :- Prove that $\sin(\alpha + n\theta) - e^{i\alpha} \sin n\theta = e^{i n \theta} \sin\alpha$
Show that $\cos(\alpha + i\beta) = \frac{1}{2}(e^{-\beta} + e^{\beta}) \cos\alpha + i/2\, (e^{-\beta} + e^{\beta}) \sin\alpha$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.615-616)

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Lecture Plan 13

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	**Topic :- Hyperbolic and Logarithmic functions, limit and continuity of a complex variable function.**	**Time Allotted:-**
1.	Introduction :- The quantity $(e^x - e^{-x})/2$ is called hyperbolic sine of x and is written as sinh x , the quantity $(e^x + e^{-x})/2$ is called hyperbolic cosine of x and is written as cosh x. If $w = e^z$, where z and w are complex numbers, then z is called a logarithmic of w to the base e and is written as $\log_e w = z$.	10 Minutes
2	Division of the Topic:- • Definition of hyperbolic functions. • Definition of logarithmic function. • Limit and continuity of a complex function.	20 Minutes
3.	Conclusion :- • sinh x , cosh x are the periodic functions with period $2\pi i$. • tanh x is a periodic function with period πi. • The logarithm of a complex number has infinite values and is thus a many-value function	5 Minutes
4	Question / Answer :- • Derive the formulae of hyperbolic functions • If $\sin(A + iB) = x + iy$, prove that $x^2 / \cosh^2 B + y^2 / \sinh^2 B = 1$ • Separate $\text{Log}(\alpha + i\beta)$ into real and imaginary parts. • Prove that $\tan[i \log(a - ib) / (a + ib)] = 2ab / (a^2 - b^2)$	15 Minutes

Assignment to be given :- If y = log tanx ,show that $\sinh ny = ½ (\tan^n x - \cot^n x)$

Prove that $\sin(\log i^i) = -1$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.617-623,630)

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Lecture Plan 14

Semester:- III   Class:- EEE.
Course Code :- Math-201- F   Subject:- Mathematics   Unit:- II

S. No.	Topic :- Differentiability and analyticity of a complex function.	Time Allotted:-
1.	Introduction :- The derivative of the complex function f(z) is denoted by f'(z) and is defined as $f'(z) = \lim_{\delta z \to 0} [f(z + \delta z) - f(z)] / \delta z$. The function f(z) is said to be differentiable at $z = z_0$ if $\lim_{\delta z \to 0} [f(z) - f(z_0)] / (z - z_0)$ exists. If a single-valued function f(z) possesses a unique derivative at every point of a region R, then f(z) is called an **analytic function** or a **regular function** or a **holomorphic function** of z in R.	10 Minutes
2	Division of the Topic:- • Differentiability of a complex function. • Analyticity of a complex function.	20 Minutes
3.	Conclusion :- • A point where the function ceases to be analytic is called a singular point. • Analytic function should be a single valued function.	5 Minutes
4	Question / Answer :- • Show that the function $f(z) = \sqrt{\lvert xy \rvert}$ is not regular at the origin. • Prove that the function f(z) defined by $f(z) = [x^3(1+i) - y^3(1-i)] / (x^2 + y^2)$, $z \neq 0$ and $f(0) = 0$ is continuous and f'(0) does not exist. • Prove that the function sinh z is analytic and find its derivative.	15 Minutes

Assignment to be given :- If w = log z, find dw/dz and determine where w is non-analytic.

Show that the function f(z) defined by $f(z) = [x^2y^3 (x + iy)] / (x^6 + y^{10}), z] \neq 0$
f (0) = 0, is not analytic at the origin.

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.631)

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Lecture Plan 15

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	Topic :- Cauchy-Riemann equations, Necessary and sufficient conditions a function to be analytic.	Time Allotted:-
1.	Introduction :- The necessary and sufficient conditions for the function $w = f(z) = u(x,y) + i\, v(x,y)$ to be analytic in a region R, are (i) $\partial u/\partial x$, $\partial u/\partial y$, $\partial v/\partial x$, $\partial v/\partial y$ are continuous functions of x and y in the region R. (ii) $\partial u/\partial x = \partial v/\partial y$, $\partial u/\partial y = - \partial v/\partial x$ The conditions in (ii) are known as **Cauchy-Riemann equations** or briefly **C.R. equations**.	10 Minutes
2	Division of the Topic:- • Cauchy-Riemann equations • The Necessary and sufficient conditions for the function f(z) to be analytic.	30 Minutes
3.	Conclusion :- • $\partial u/\partial x = \partial v/\partial y$, $\partial u/\partial y = - \partial v/\partial x$ are the Cauchy-Riemann equations.	5 Minutes
4	Question / Answer :- •	5 Minutes

Assignment to be given :- State & prove the necessary and sufficient condition a function to be analytic.

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.631-632)

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Lecture Plan 16

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	Topic :- problems on analytic function	Time Allotted:-
1.	Introduction :- Revision of previous lecture	10 Minutes
2	Division of the Topic:- • Cauchy-Riemann equations • The Necessary and sufficient conditions for the function f(z) to be analytic.	20 Minutes
3.	Conclusion :- • $\partial u/\partial x = \partial v/\partial y$, $\partial u/\partial y = - \partial v/\partial x$ are the Cauchy-Riemann equations.	5 Minutes
4	Question / Answer :- • Prove that the function f(z) defined by $f(z) = [x^3(1+i) - y^3(1-i)] / (x^2 + y^2)$, $z \neq 0$ and $f(0) = 0$ is continuous and the Cauchy- Riemann equations are satisfied at the origin, yet f'(0) does not exist. •	15 Minutes

Assignment to be given :- Show that the function f(z) defined by $f(z) = [x^2y^3 (x + iy)] / (x^6 + y^{10}), z] \neq 0$ f (0) = 0, is not analytic at the origin even though it satisfies Cauchy- Riemann equations at the origin.

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.631-632)

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Lecture Plan 17

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	Topic:- Polar form of Cauchy-Riemann equation .	Time Allotted:-
1.	Introduction:- • If (r,θ) be the co-ordinates of a point whose Cartesian co-ordinates are (x ,y), then $z = x + iy = re^{i\theta}$ • C-R equations $\partial u/\partial r = \partial v/r\partial\theta$, $\partial v/\partial r = -\partial u/r\partial\theta$	10Minutes
2	Division of the Topic:- • Derivation of the Polar form of Cauchy-Riemann equations.	15Minutes
3.	Conclusion :- • There are different Cauchy-Riemann equations for polar and Cartesian functions	05Minutes
4	Question / Answer :- • $f(z) = \log r + i\theta$ then show that C-R eq. are satisfied.(polar form) OR $f(z) = \log z$ then show that C-R eq. are satisfied (Cartesian form)	20Minutes

Assignment to be given:- Deduce that $\partial^2u/\partial r^2 + \partial u/r\partial r + \partial^2u/r^2\partial\theta^2 = 0$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.634)

Lecture Plan 18

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	Topic:-Harmonic function and Applications to flow problems. :- Milne Thomson method	Time Allotted:-
1.	**Introduction:-** • If $\partial^2u/\partial x^2 + \partial^2u/\partial y^2 = 0$,$\partial^2v/\partial x^2 + \partial^2v/\partial y^2 = 0$. Thus both the functions u and v satisfy the Laplace's equation in two Variables. For this reason, they are known as Harmonic functions. • $W(z) = \phi(x, y) + i\,\Psi(x, y)$; where w(z) is complex potential. $\phi(x, y)$ is velocity potential. $\Psi(x, y)$ is stream fn. **Milne Thomson method** let $f(z)= u(x,y)+iv(x,y)$ Replace x by z and y by 0 then above becomes $f(z) = u(z,0) + iv(z,0$	10Minutes 20Minutes
2	**Division of the Topic:-** • Define Harmonic function . • Define Applications to flow problems.	05Minutes
3.	**Conclusion :-** • C-R equations in flow problem is $\partial\phi/\partial x = \partial\Psi/\partial y$ $\partial\phi/\partial y = - \partial\Psi/\partial x$	15Minutes
4	**Question / Answer :-** • An electrostatic field in the xy – plane is given by the potential function $\phi = 3x^2y - y^3$, find the stream function. • Find the velocity potential fn. ϕ, if the stream function is $\Psi = -y/(x^2 + y^2)$.	

Assignment to be given:- Find the velocity potential fn. ϕ, if the stream function is $\Psi = \tan^{-1}(y/x)$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.635-636)

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Lecture Plan 19

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	Topic:- Integration of complex function.(Line integral)	Time Allotted:-
1.	Introduction:- • Consider a continuous function f(z) of the complex variable z = x + iy defined at all points of a curve C having end points A and B. Divide C into n parts at the points .In such a way that the length of the chord δz_i approaches zero, is called the line integral of f(z) taken along the path C, i.e. $\int_c f(z)dz$	10Minutes
2	Division of the Topic:- • Define integration of complex function. • Problems on complex function integral.	20Minutes
3.	Conclusion :- • $\int_c f(z)dz = \int_c (u + iv)(dx + idy)$	05Minutes
4	Question / Answer :- • Prove that $\int_c dz/z = -\pi i$ or πI , according as C is the semi –circular arc IzI=1 above or below the real axis. • Evaluate $_0\int^{1+i} (x^2 + iy)dz$ along the paths y=x and y=x^2.	15Minutes

Assignment to be given:-

- Show that for every path between the limits $_{-2}\int^{-2+i} (2+z)^2 dz = -i/3$.

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.652)

Doc. No.: DCE/0/03
Revision :00

Lecture Plan 20

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- II

S. No.	Topic:- Cauchy theorem , Cauchy's Integral Formula .	Time Allotted:-
1.	Introduction:- • If f(z) is Analytic within and on a closed curve and if a is any point within C, then $f(a) = 1/2\pi i \int_c f(z)dz/(z-a)$ • $f^n(a) = n!/2\pi i\int_c f(z)dz/(z-a)^{n+1}$	10Minutes
2	Division of the Topic:- • State and Prove Cauchy's Integral Formula. • Problems based on Cauchy's Integral Formula.	20Minutes
3.	Conclusion :- • If the point 'a' lies inside and on the circle C, then Cauchy's Integral formula is applicable at 'a'.	05Minutes
4	Question / Answer :- • Evaluate, using Cauchy's integral formulae: $\int_c(z^3-2z+1)dz/(z-i)^2$, where C is $\lvert z \rvert=2$. • If $\phi(\zeta)= \int_c(3z^2+7z+1)dz/(z-\zeta)$, where C is the circle $x^2+y^2=4$,find the values of (i) $\phi(3)$ (ii) $\phi'(1-i)$ (IV) $\phi''(1-i)$.	15Minutes

Assignment to be given:-Evaluate, using Cauchy's integral formulae:$\int_c(z^2+1)dz/z(2z+1)$,where C is $\lvert z \rvert = 1$.

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal (P.654-655)

Doc. No.: DCE/0/03
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Lecture Plan 21

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	**Topic:- Power series ,radius and circle of convergence of power series.**	**Time Allotted:-**
1.	Introduction:- A series of the form $a_0 + a_1z + a_2z^2 + \ldots\ldots a_nz^n + \ldots..$, where the a's are independent of z , is called power series in z. such a series may converge for some or all values of z. A circle $\vert z \vert = R$ which includes in its interior $\vert z \vert < R$ all the values of z for which series $\sum a_n (z)^n$ converges, is called the circle of convergence and R is called the radius of convergence.And the point a is called the centre of of convergence.	10Minutes
2	Division of the Topic:- • Define the term radius and circle of convergence of power series. • Formula or test for finding the radius and centre of convergence.	20Minutes
3.	Conclusion :- • With the help of given formula , the radii and centre of Convergence can be found .	05Minutes
4	Question / Answer :- • Find the radii of convergence of the following power series: (i) $\sum ((-1)^n / n)(z-2i)^n$ (ii)) $\sum 2^{-n} z^n / (1 + in^2)$	15Minutes

Assignment to be given:- :- Find the radii of convergence of the following power series:

(i) $\sum (z)^n / n!$

(ii)) $\sum (n!) z^n / 2n!$

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal (P.660)

Doc. No.: DCE/0/03
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Lecture Plan 22

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	Topic:- Taylor's series and Maclaurine's series. . :- Laurent's series	Time Allotted:-
1.	Introduction:- Taylor' series : If f(z) is analytic inside a circle C with centre at a , then for z inside C, $$f(z) = f(a) + f^{'}(a)(z-a) + (f^{''}(a)/2!)(z-a)^2 + \ldots\ldots\ldots + (f^{n}(a)/n!)(z-a)^n + \ldots\ldots$$ Maclaurine' series : If f(z) is analytic inside a circle C with centre at origin , then for z inside C, $$f(z) = f(0) + f^{'}(0)(z) + (f^{''}(0)/2!)(z)^2 + \ldots \ldots + (f^{n}(0)/n!)(z)^n$$ • If f(z) is Analytic in the ring-shaped region R bounded by two concentric circles C and C1 of radii and r_1 ($r > r_1$) and with centre at a , then for all z in R d on a closed curve and if a is any point within C, then $$f(z) = a_0 + a_1(z-a) + a_2(z-a)^2 + \ldots\ldots\ldots a_{-1}(z-a)^{-1} + a_{-2}(z-a)^{-2} + \ldots..$$ $$a_n = 1/2\pi i \int_c f(t)dt/(t-a)^{n+1}$$ where c being any curve in R , encircling C_1.	10Minutes 30Minutes
2	Division of the Topic:- • State and Prove Taylor'series. • State and Prove Maclaurine's series • Problems based on these series. If f(z) is is analytic inside c then Laurent series reduce to Taylor series. • There may be different Laurent series of f(z) in two annuli with the same centre. But for one annulus , it is unique. •	05Minutes
3.	Conclusion :- • Any complex analytic function can always be represented by power series like Taylor's series and Maclaurines's series., Laurent series	5Minutes
4	Question / Answer :- • Obtain the expansion of $(z-1)/z^2$ in a Taylor's series in power of • $(z-1)$ and determine the region of convergence. • Find the Laurent 's expansion of • (i) $(z-1)/z^2$ for $\lvert z-1 \rvert < 1$ • (ii) $(z^2-1)/(z^2-5z+6)$ about $z = 0$ in the region $2 < \lvert z \rvert < 3$.	

Assignment to be given:-Expand $(z-1)/(z+1)$ in Taylor's series about the point.
(i) $z = 0$ and
(ii) (ii) $z = 1$.

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal (P.661)

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Lecture Plan 23

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	Topic:- Zero's and singularities of complex function Rasidue, Residue theorem	Time Allotted:-
1.	Introduction:- A zero of an analytic function f(z) is that value of z for which f(z) = 0 Singularity of a complex function is that point at which the function ceases to be analytic. The co-efficient of $(z-a)^{-1}$ in the expansion of f(z) around an isolated singularity is called the Residue of f(z) at that point. thus in the Laurent 's series expansion of f(z) around z = a , the residue of f(z) at z = a is a_{-1} Res f(a) = 1 / (2Л i) $\int_C$ f(z) dz	10Minutes
2	Division of the Topic:- • Define singularity and zero of complex function. • Types of singularities. • Statement Residues theorem • Calculation of residues. • Problems based on these topics.	30Minutes
3.	Conclusion :- • From the above formulae , we can find the zero , singularities and residue of the given complex function. And with these results , definite complex integral can be evaluated more easily.	05Minutes
4	Question / Answer :- • Determine the poles of the function and residue at each pole: • $(z^2 + 1) / (z^2 - 2z)$ • Evaluate the integral : $\int_C e^z dz / (z^2 + 1)$: $\lvert z \rvert = 2$	5Minutes

Assignment to be given:-. Determine the poles of the function and residue at each pole:
$(z^2 -2z) / (z^2 +1) (z + 1)^2$
Evaluate the integral : $\int_C$ z secz dz / $(1 - z)^2$, C : $\lvert z \rvert = 3$

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal (P.665-668)

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Lecture Plan 24

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	Topic:-Evaluation of real definite integral around the unit circle	Time Allotted:-
1.	Introduction:- An integral of the type : $\int_0^{2\pi} f(\sin\Theta , \cos\Theta)\, d\Theta$, Where the integrand is a rational function of $\sin\Theta$ and $\cos\Theta$ can be evaluated by writing $e^{i\Theta} = z$. Since $\sin\Theta = 1 / 2i\,(z - 1/z)$, $\cos\Theta = 1 / 2\,(z + 1/z)$, then integral takes the form : $\int_C f(z)\, dz$, where f(z) is a rational function of z and C is a unit circle $\lvert z \rvert = 1$	10Minutes
2	Division of the Topic:- • Method for calculating the real definite integral around the unit circle. • Problems based on that topic.	15Minutes
3.	Conclusion :- In that case the integral is equal to $2\pi i$ times the sum of the residues at those poles of f(z) which are within C. Many important definite integral can be calculated more easily.	05Minutes
4	Question / Answer :- Apply the calculus of residue , prove that $\int_0^{2\pi} d\Theta / (5 - 3\cos\Theta)^2 = 5\pi / 32$ $\int_0^{2\pi} d\Theta / (1 - 2a\sin\Theta + a^2) = 2\pi / (1 - a^2)$	20Minutes

Assignment to be given:-. Apply the calculus of residue , prove that

$$\int_0^{\pi} d\Theta / (17 - 8\cos\Theta) = \pi / 15$$

$$\int_0^{2\pi} a\, d\Theta / (a^2 + \sin^2\Theta) = \pi / (1 + a^2)^{1/2}$$

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal (P.671)

Doc. No.: DCE/0/03
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Lecture Plan 25

Semester:- III   Class:- EEE.
Course Code :- Math-201- F   Subject:- Mathematics   Unit:- III

S. No.	Topic:-Evaluation of real definite integral around a small semi circle	Time Allotted:-
1.	Introduction:- To evaluate $\int_{-\infty}^{\infty} f(x)\,dx$, we consider $\int_C f(z)\,dz$, where C is the contour consisting of the semi circle $C_R : \lvert z \rvert = R$, together with the diameter that closes it.	10Minutes
2	Division of the Topic:- • Method for calculating the real definite integral around a semi circle. • Problems based on that topic.	15Minutes
3.	Conclusion :- In that case the integral is equal to 2Лi times the sum of the residues at those poles of f(z) which are within C. Many important definite integral can be calculated more easily.	05Minutes
4	Question / Answer :- Apply the calculus of residue , prove that $\int_{-\infty}^{\infty} x^2\,dx / (x^2 + a^2)(x^2 + b^2) = Л / (a + b)$ $\int_{0}^{\infty} \cos ax\,dx / (x^2 + 1) = Л / 3$	20Minutes

Assignment to be given:-. Apply the calculus of residue , prove that

$$\int_{-\infty}^{\infty} x^2\,dx / (x^2 + 1)(x^2 + 4) = Л / 3$$
$$\int_{-\infty}^{\infty} dx / (x^4 + 1) = Л / 2^{1/2}$$

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal (P.673)

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Lecture Plan 26

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	Topic:- Probability distributions: Conditional probability. Baye's theorem and	Time Allotted:-
1.	Introduction:- • The probability of the happening of an event E_1 When another event E_2 is known to have already happened is called conditional probability and is denoted by $P(E_1/E_2)$. • The probability of simultaneous occurrence of two events is equal to the probability of one of the events multiplied by the conditional probability of the other , i.e., for two events A and B, $P(A\cap B) = P(A)P(B/A)$ OR $P(B)P(A/B)$ If E_1, E_2, E_3,-----------E_n are mutually exclusive and exhaustive events with $P(E_i) \neq 0$, (i=1,2,3-------n) of a random experiment then for any arbitrary event A of the sample space of the above experiment with $P(A)>0$, we have $P(Ei/A) = \frac{P(Ei)P(A/E_i)}{\Sigma P(Ei)P(A/E_i)}$	10Minutes 10Minutes
2	Division of the Topic:- • State and prove multiplicative law of probability Or Compound probability theorem. • Problems of compound probability theorem. State and Prove Baye's theorem. • Numerical based on Baye's theorem	05Minutes
3.	Conclusion :- • $P(A\cap B) = P(A)P(B/A) = P(B)P(A/B)$ Question on Baye's th.	15Minutes
4	Question / Answer :- • Two dice are tossed once. Find the probability of getting an even number on the first die or a total of 8? • A class consist of 80 students, 25 of them are girls and 55 boys, 10 of them are rich and the remaining poor, 20 of them are fair complexioned. What is the probability of selecting a fair complexioned rich girl?	

Assignment to be given:-A drawer contains 50 bolts and 150 nuts. Half of the bolts and half of the nuts are rusted. If one item is chosen at random, what is the probability that it is rusted or a bolt?

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.770)
Fundamental of Statistics by S.C Gupta & V.K. Kapoor

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Revision :00

Lecture Plan 27

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	Topic: - Expected value of random variable.	Time Allotted:-
1.	Introduction:- • If the numerical values assumed by a variable are the result of some chance factors, so that a particular value cannot be exactly predicted in advance, the variable is then called a random variable. • Expected value of random variable is denoted by E(x) i.e. $E(x) = \Sigma x_i\, p(x_i)$	10Minutes
2	Division of the Topic:- • Define random variable. • Expected value of random variable.	20Minutes
3.	Conclusion :- • Random variables are denoted by capital letters i.e. X, Y, Z e.t.c. • Expected value means average or mean. • Variance (σ^2) = $\Sigma P_i (x_i - \mu)^2 = \Sigma P_i x_i^2 - \mu^2$ • Standard deviation $\sigma = \sqrt{\text{variance}}$. • $\Sigma P_i = 1$	05Minutes
4	Question / Answer :- • An Urn contains 4 white and 3 red balls. Three balls are drawn, with replacement, from this urn. Find mean, variance and S.D. for the number of red balls drawn. • A random variable X has the following probability distribution: Values of X, x : 0 1 2 3 4 5 6 7 8 P(x): a 3a 5a 7a 9a 11a 13a 15a 17a (i) Determine the value of a. (ii) What is the smallest value of x for which $P(X \le x) > 0.5$?	15Minutes

Assignment to be given: - A die is tossed twice. Getting a number greater than 4 is considered a success. Find the variance of the probability distribution of the number of successes?

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.776-779)
Fundamental of Statistics by S.C Gupta & V.K. Kapoor

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Lecture Plan 28

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	Topic:-Binomial probability distribution and its properties.	Time Allotted:-
1.	Introduction:- • Let a random variable X denote the number of successes in these n trials. P be the probability of a success and q that of a failure in a single trial so that p+q = 1. The probability of r successes in n trials. $P(X=r) = {}^{n}C_r\, p^r q^{n-r}$, where r = 0,1,2,----,n.	10Minutes
2	Division of the Topic:- • Derivation of Binomial Probability Distribution. • Mean, Variance and moments of Binomial Probability Distribution. • Recurrence formula for binomial distribution.	30Minutes
3.	Conclusion :- • Mean of the Binomial Probability Distribution is **np.** • Variance of the Binomial Probability Distribution is **npq.** • Standard deviation of the Binomial Probability Distribution is **√npq.**	05Minutes
4	Question / Answer :- • If on an average 1 vessel in every 10 is wrecked, find the probability that out of 5 vessels expected to arrive, at least 4 will arrive safely. • Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones: X: 0 1 2 3 4 5 F: 2 14 20 34 22 8	5Minutes

Assignment to be given: - If the mean of a binomial distribution is 3 and the variance is 3/2, find the probability of obtaining at least 4 successes.

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal(P.783-785)
Fundamental of Statistics by S.C Gupta & V.K. Kapoor

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Revision :00

Lecture Plan 29

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- III

S. No.	Topic: - Poisson distribution and its properties.	Time Allotted:-
1.	Introduction:- • Poisson distribution is applicable when n is large and p is very small then Poisson prob. Distribution is $P(x=r) = e^{-\lambda}\lambda^r/r!$; (r=0,1,2,3----) • Recurrence formula for the Poisson distribution is $P(r+1) = \lambda P(r)/(r+1)$, r=0, 1, 2, 3, ----------	10Minutes
2	Division of the Topic:- • Poisson distribution as a limiting case of binomial distribution. • Derivation of Recurrence formula for the Poisson distribution. • Properties of Poisson distribution.	30Minutes
3.	Conclusion :- • Mean and Variance of the Poisson distribution is same, i.e. λ • Poisson prob. Distribution is $P(x=r) = e^{-\lambda}\lambda^r/r!$; (r=0,1,2,3----)	05Minutes
4	Question / Answer :- • If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction. • If X is a Poisson variate such that P(X=2) =9P(X=4) +90P(X=6), find the standard deviation.	5Minutes

Assignment to be given:-In a certain factory turning razor blades, there is a small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 10000 packets.

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.786-787)
Fundamental of Statistics by S.C Gupta & V.K. Kapoor

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Revision :00

Lecture Plan 30

Semester:- III   Class:- EEE.
Course Code :- Math-201- F   Subject:- Mathematics   Unit:- III

S. No.	Topic:-Normal distribution.	Time Allotted:-
1.	Introduction:- • The normal distribution is a continuous distribution. It can be derived from the binomial distribution in the limiting case when n, the number of trials is large and p the probability of a success is close to ½. The general equation of the normal distribution is given by $F(x)= e^{-1/2\ (x-\mu/\sigma)2}/\sigma\sqrt{2\pi}$	10Minutes
2	Division of the Topic:- • Define Normal distribution as a limiting form of binomial distribution. • Problems of Normal distribution. The mean of the normal distribution. • For a normal curve, the ordinate at the mean is the maximum ordinate. • The mode of the normal distribution. • The median of the normal distribution. • The variance and standard deviation of a normal distribution. • The point of inflexion of the normal curve. • The mean deviation from the mean is about 4/5 of its standard deviation.	20Minutes
3.	Conclusion :- • The graph of the normal distribution is called the normal curve. It is bell-shaped and symmetrical about the mean μ .The two tails of the curve extend to +∞ and-∞ towards the positive and negative directions of the x-axis. • Prove that the total area under normal probability curve is unity. • Prove that The mode = The mean = m • Prove that Mean deviation from the mean = 4/5 Standard deviation.	05Minutes
4	Question / Answer :- • The mean height of 500 male students in a certain college is 151cm and the standard deviation is 15 cm. Assuming the heights are normally distributed, find how many students have heights between 120 and 155cm?	15Minutes

Assignment to be given:- The mean and standard deviation of the marks obtained by 1000 students in an Examinations are respectively 34.4 and 16.5. Assuming the normality of the distribution, find the approximate number of students expected to obtain marks between 30 and 60.

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.789)
Fundamental of Statistics by S.C Gupta & V.K. Kapoor

Doc. No.: DCE/0/03
Revision :00

Lecture Plan 31

Semester:- III   Class:- EEE.
Course Code :- Math-201- F   Subject:- Mathematics   Unit:- IV

S. No.	Topic: - Testing of Hypothesis, test of significance for large samples.	Time Allotted:-
1.	Introduction:- • To reach decisions about populations on the basis of sample information, We make certain assumptions about the populations involved. Such assumptions, which may or may not be true, are called **statistical hypothesis.**	05Minutes
2	Division of the Topic:- • Define Errors, Null hypothesis, level of significance, test of significance. • Procedure of test of significance for large samples. • Confidence Limits at 5% and 1% level of significance.	30Minutes
3.	Conclusion :- • If $\|z\|<1.96$, difference between the observed and expected number of successes is not significant. • If $\|z\|>1.96$, difference is significant at 5% level of significance. • If $\|z\|>2.58$, difference is significant at 1% level of significance	05Minutes
4	Question / Answer :- • A coin is tossed 400 times and it turns up head 216 times. Discuss whether the coin may be an unbiased one. • A sample of 1000 days is taken from meteorological records of a certain district and 120 of them are found to be foggy. What are the probable limits to the percentage of foggy days in the district?	10Minutes

Assignment to be given:-A machine produces 16 imperfect articles in a sample of 500. After machine is overhauled, it produces 3 imperfect articles in a batch of 100. Has the machine been improved?

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.800-801)
Fundamental of Statistics by S.C Gupta & V.K. Kapoor

Doc. No.: DCE/0/03
Revision :00

Lecture Plan 32

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- IV

S. No.	Topic:-Student's - t- Distribution. Chi-Square (χ^2) Test.	Time Allotted:-
1.	Introduction:- • t-distribution is used when sample size is ≤30 and the population standard deviation is unknown. t-statistics is defined as $t = \frac{\bar{x} - \mu}{s/\sqrt{n}} \sim t(n-1\ d.f.)$ d.f.-degree of freedom • Where $s = \sqrt{\Sigma(x-\bar{x})^2/n-1}$If $O_1,O_2,O_3,$-----------$,O_n$ be a set of observed frequencies and $E_1,E_2,$----E_n be the corresponding set of expected frequencies, then Chi-Square is defined by the relation $\chi^2 = \frac{(O_1-E_1)^2}{E_1} + \frac{(O_2-E_2)^2}{E_2} +$-----------------+ $\frac{(O_n-E_n)^2}{E_n}$ $= \Sigma (0_i - E_i)^2/E_i$, with n-1 degrees of freedom	10Minutes
2	Division of the Topic:- • Define student's -t-distribution. • Application of t-distribution. • Confidence limit of t-test.	20Minutes
3.	Conclusion :- • t_α is the tabulated value and $\lvert t \rvert$ is calculated value. If calculated value is such that $\lvert t \rvert < t_\alpha$ then null hypothesis is accepted. If calculated value is such that $\lvert t \rvert > t_\alpha$ then null hypothesis is rejected. • (n-1) is degree of freedom. Define Chi-Square distribution. • Properties of Chi-Square distribution. • Procedure to test significance and goodness of fit. •	05Minutes
4	Question / Answer :- Question on Chi-Square distribution • A sample of 18 items has a mean 24 units and standard deviation 3 units. Test the hypothesis that it is a random sample from a normal population With mean 27 units. • The following values give the length of 12 samples of Egyptian cotton taken from a consignment: 48, 46, 49, 52, 45, 43, 47, 47, 46, 45, 50.Test if the mean length of the consignment can be taken as 46.	15Minutes

Assignment to be given:-
Reference Readings:- Higher Engineering Mathematics by B.S.Grewal (P.807-813)
Fundamental of Statistics by S.C Gupta & V.K. Kapoor

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Revision :00

Lecture Plan 33

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- IV

S. No.	Topic: - Linear programming problems formulation.	Time Allotted:-
1.	Introduction: - To begin with, a problem is to be presented a linear programming form which requires defining the variables involved establishing relationships between them and formulating the objective function and the constraints.	5 Minutes
2	Division of the Topic:- • Procedure of formulation of linear programming problems.	15 Minutes
3.	Conclusion :- • The variables that enter into the problem are called **decision variable**. • The inequalities are called the **constraints**. • The objective function and the constraints being all linear, it is a linear programming problem (L.P.P.).	5 Minutes
4	Question / Answer :- • A manufacturer produces two types of models M_1 and M_2. Each M_1 model requires 4 hours of grinding and two hours of polishing; where as each M_2 model requires 2 hours of grinding and 5 hours of polishing. The manufacturer has 2 grinders and 3 polishers. Each grinder works for 40 hours a week and each polisher works for 60 hours a week. Profit on an M_1 model is Rs. 3 and on M_2 model is Rs. 4. Whatever is produced in a week is sold in the market. How should the manufacturer allocate his production capacity to the two types of models so that he may make the maximum profit in a week?	25 Minutes

Assignment to be given: - A firm manufacturers headache pills in two sizes A and B. Size A contains 2 grains of asprin, 5 grains of bicarbonate and 1 grain of codeine. Size B contains 1 grains of asprin, 8 grains of bicarbonate and 6 grains of codeine. It is found by users that it requires at least 12 grains of asprin, 74 grains of bicarbonate and 24 grain of codeine for providing immediate effect. It is required to determine the least number of pills a patient should take to get immediate relief. Formulate the problem as a standard L.P.P

Reference Readings: - Higher Engineering Mathematics by B.S.Grewa (P.959)
Operation research by S.D. Sharma.

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Revision :00

Lecture Plan 34

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- IV

S. No.	Topic: - Solving linear programming problems using Graphical method.	Time Allotted:-
1.	Introduction: - Linear programming problems involving only two variables can be effectively solved by a graphical technique which provides a pictorial represent – tation of the solution.	5 Minutes
2	Division of the Topic:- • Working procedure to solve a linear programming problem.	20 Minutes
3.	Conclusion :- • A region or a set of points is said to be convex if the line joining any two of its points lies completely in the region. • There are a unique optimal solution, an infinite number of optimal solutions, an unbounded solution and no solution of L.P.P.	5 Minutes
4	Question / Answer :- • Find the maximum value of $Z = 2x + 3y$ subject to the constraints: $x + y \le 30$, $y \ge 3$, $0 \le y \le 12$, $x - y \ge 0$ and $0 \le x \le 20$. • Maximize $Z = 2x_1 + 3x_2$ subject to $x_1 - x_2 \le 2$ $x_1 + x_2 \ge 4$ $x_1, x_2 \ge 0$	20 Minutes

Assignment to be given: - Solve by Graphical method
Minimize $Z = 20\,x_1 + 10\,x_2$
Subject to $x_1 + 2x_2 \le 40$, $3x_1 + x_2 \ge 30$, $4x_1 + 3x_2 \ge 60$; $x_1, x_2 \ge 0$

Reference Readings:- Higher Engineering Mathematics by B.S.Grewal(P.962)
Operation research by S.D. Sharma.

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Lecture Plan 35

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- IV

S. No.	Topic: - Solving linear programming problems using Simplex method.	Time Allotted:-
1.	Introduction: - While solving an L.P.P. if the optimal solution was not unique, the optimal points were on an edge. These observations also holds true for the general L.P.P. Essentially the problem is that of finding the particular vertex of the convex region which corresponds to the optimal solution. The most commonly used method for locating the optimal vertex is the **simplex method**.	5 Minutes
2	Division of the Topic:- • Procedure of Simplex method to solve a L.P.P.	20 Minutes
3.	Conclusion :- • In Simplex method, an infinite number of solutions are reduced to a finite number of promising solutions.	5 Minutes
4	Question / Answer :- • Find all basic solutions of the system of equations identifying in each case the basic and non-basic variables: $2x_1 + x_2 + 4x_3 = 11$, $3x_1 + x_2 + 5x_3 = 14$ Investigate whether the basic solutions are degenerate or not. Hence find the basic-feasible solution of the system. • Using simplex method Maximize $Z = 5x_1 + 3x_2$, subjected to $x_1 + x_2 \leq 2$, $5x_1 + 2x_2 \leq 10$, $3x_1 + 8x_2 \leq 12$; x_1 , $x_2 \geq 0$	20 Minutes

Assignment to be given: - Solve the L.P.P. by simplex method
Minimize $Z = x – 3x + 3x$, subject to
$3x_1 – x_2 + 2x_3 \leq 7$, $2x_1 + 4x_2 \geq - 12$, $- 4x_1 + 3x_2 + 8x_3 \leq 10$; $x_1,x_2,x_3 \geq 0$

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal(P.972-973)
Operation research by S.D. Sharma.

Doc. No.: DCE/0/03
Revision :00

Lecture Plan 36

Semester:- III Class:- EEE.
Course Code :- Math-201- F Subject:- Mathematics Unit:- IV

S. No.	Topic: - Solving the Linear programming problems by Dual-Simplex method.	Time Allotted:-
1.	Introduction: - The Dual-Simplex method is quite similar to the regular simplex method; the only difference lies in the criterion used for selecting the incoming and outgoing variables. In the dual simplex method, we first determine the outgoing variable and then the incoming variable while in the case of regular simplex method reverse is done.	5 Minutes
2	Division of the Topic:- • Working procedure for dual simplex method to solve a L.P.P.	20 Minutes
3.	Conclusion :- • Every problem converts to maximization form. • Express the problem in standard form by introducing slack variables.	5 Minutes
4	Question / Answer :- • Using dual simplex method: Maximize $Z = -3x_1 - 2x_2$ Subject to $x_1 + x_2 \geq 1$, $x_1 + x_2 \leq 7$, $x_1 + 2x_2 \geq 10$, $x_2 \geq 3$; $x_1 \geq 0$, $x_2 \geq 0$. • Using dual simplex method, solve the following problem Maximize $Z = 2x + 2x + 4x$ Subject to $2x_1 + 3x_2 + 5x_3 \geq 2$, $3x_1 + x_2 + 7x_3 \leq 3$, $x_1 + 4x_2 + 6x_3 \leq 5$; $x_1, x_2, x_3 \geq 0$	20 Minutes

Assignment to be given: - Using dual simplex method, solve
Minimize $Z = x + 2x + 3x$
Subject to $2x_1 - x_2 + x_3 \geq 4$, $x_1 + x_2 + 2x_3 \leq 8$, $x_2 - x_3 \geq 2$; $x_1, x_2, x_3 \geq 0$

Reference Readings: - Higher Engineering Mathematics by B.S.Grewal(P.992)
Operation research by S.D. Sharma.