Engineering Mathematics 2021-09-23-10-25-06

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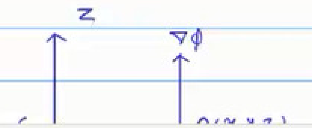
$d\phi = \nabla\phi \cdot d\bar{r} = |\nabla\phi||d\bar{r}|\cos\theta$, where θ is the angle between the vectors $\nabla\phi$ and $d\bar{r}$. If $\nabla\phi$ and $d\bar{r}$ are in the same direction then $\theta = 0$ $\therefore$ $d\phi = |\nabla\phi||d\bar{r}|$

Since $\cos\theta = 1$ is the maximum value of $\cos\theta$, $d\phi$ is maximum at $\theta = 0$ and its maximum value is $|\nabla\phi||d\bar{r}|$

Applications of grad ϕ ($\nabla\phi$):

1) Normal :



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ENG 18:22 05-10-2023

All sessions in India Time (Mumbai, GMT+05:30)

Search Results from 1/21/21 to 2/5/21

Session ID	Topic	Meeting T	Username	Name	Date	Duration	Invited	Registered	Client atte	Audio typ	People Mi	Local toll c	Local toll-f	Local callo	Intl. callou	Internal Ca	Intl. call-in	Integrated	VoIP
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APPLICATION OF LDE TO ELECTRICAL CIRCUIT

Kirchhoff's Voltage Law (KVL) :

The algebraic sum of the voltage drops around any closed circuit is equal to the total electromotive force (e.m.f.) in the circuit

Kirchhoff's Current Law (KCL) :

At any point of a circuit the sum of the inflowing currents is equal to the sum of the out flowing current.

We consider the following circuits.

i) L – C circuit

We consider the following L - C circuits without and with an electromotive force $E(t)$.

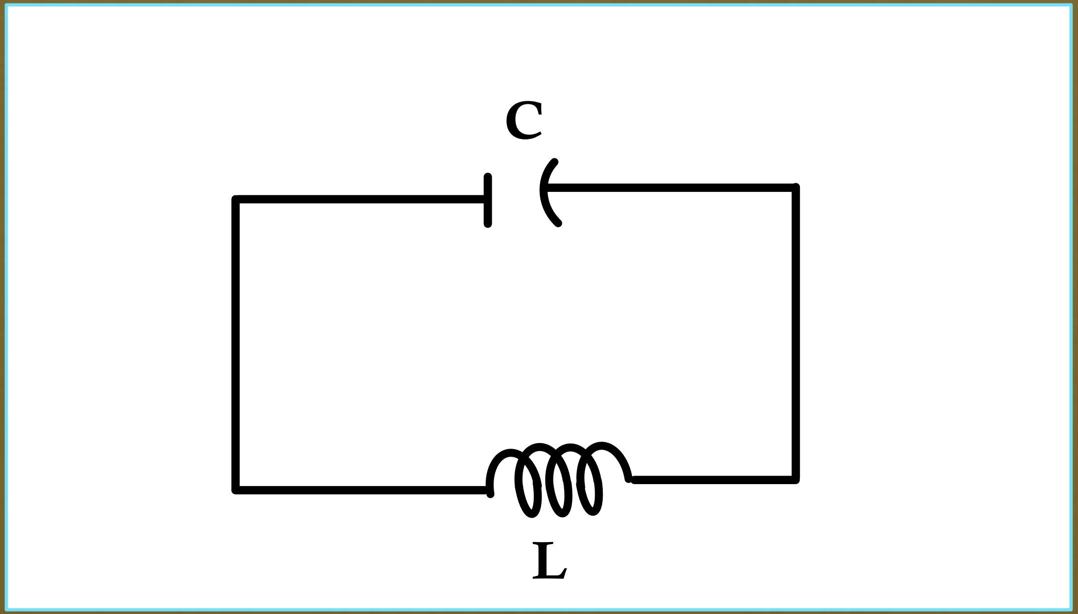


Figure (a)

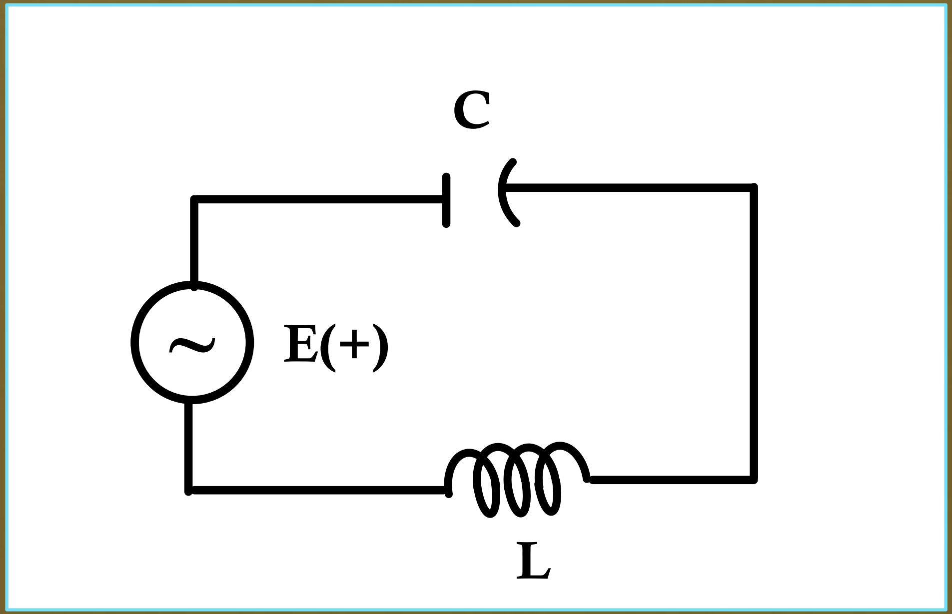


Figure (b)

$$\text{The voltage drop across inductor} = L\frac{di}{dt} = L\frac{d^2q}{dt^2}$$

$$\left[\because i = \frac{dq}{dt}\right]$$

$$\text{The voltage drop across capacitor} = \frac{q}{C}$$

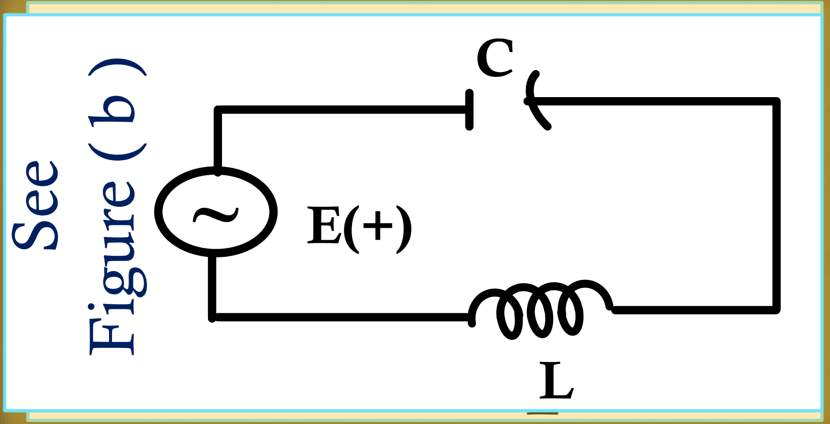
By Kirchhoff's voltage law , the sum of voltage drop across the capacitor and inductor is equals to total e.m.f. in the circuit.

Thus the differential equation for the circuit in fig (a) and fig (b) respectively are

$$L\frac{d^2q}{dt^2} + \frac{q}{C} = 0 \qquad \Rightarrow \frac{d^2q}{dt^2} + \frac{1}{LC}q = 0$$

and

$$L\frac{d^2q}{dt^2} + \frac{q}{C} = E(t) \Rightarrow \frac{d^2q}{dt^2} + \frac{1}{LC}q = \frac{1}{L}E(t)$$



i) L – C – R Circuits :

Consider the following L – C – R circuits without and with an electromotive force $E(t)$.

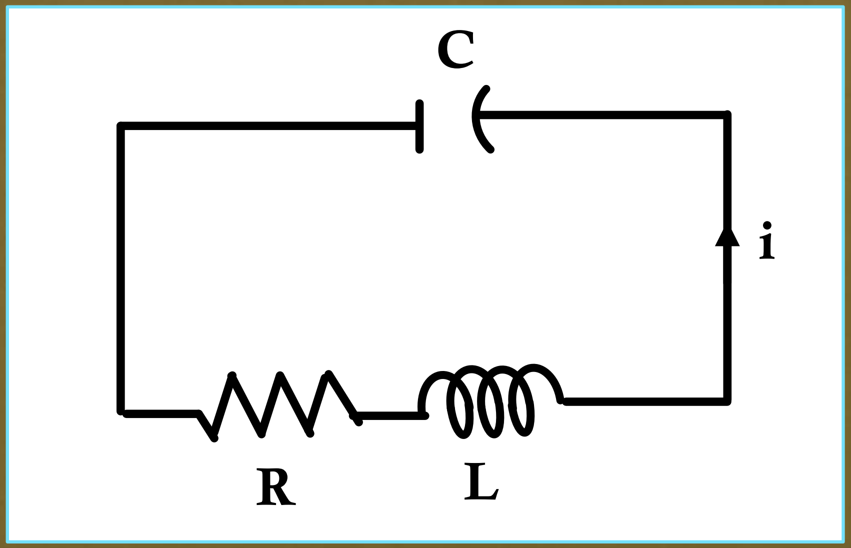


Figure (c)

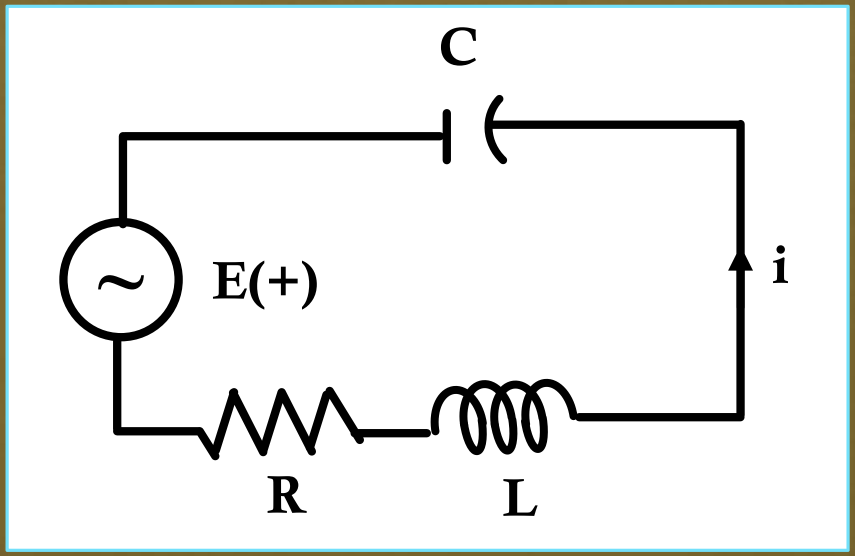
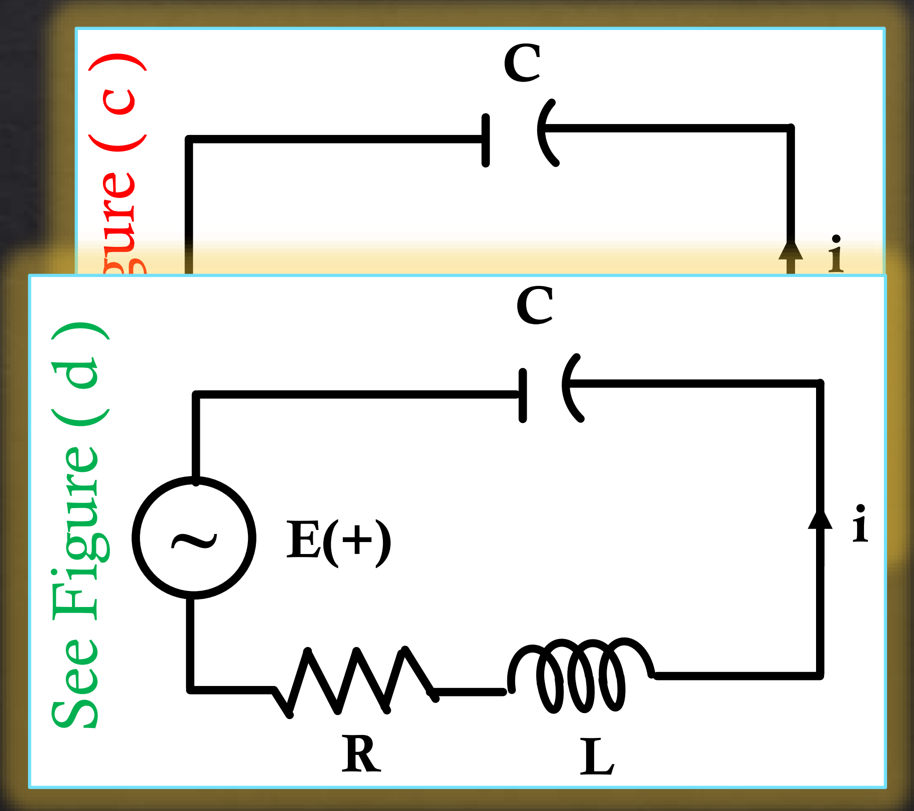


Figure (d)

Since the voltage drop across L , C and R respectively.

$$L\frac{di}{dt} = L\frac{d^2q}{dt^2} \quad , \frac{q}{C} \quad \text{and } R_i = R\frac{dq}{dt}$$

Therefore by Kirchhoff's voltage law , differential equation for the circuits in fig. (c) and fig. (d) are respectively.



$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = 0$$

$$L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E(t) \quad \text{- - - - -} \quad (\text{ i })$$

Note that the differential equation (i) contains dependent variable q.

Differentiating (i) w.r.t. t we get

$$L\frac{d^3q}{dt^3}+R\frac{d^2q}{dt^2}+\frac{1}{C}\frac{dq}{dt}=\frac{dE}{dt} \quad \text{- - - - -} \quad (\text{ii})$$

Using $i=\frac{dq}{dt}$, in (ii) we get

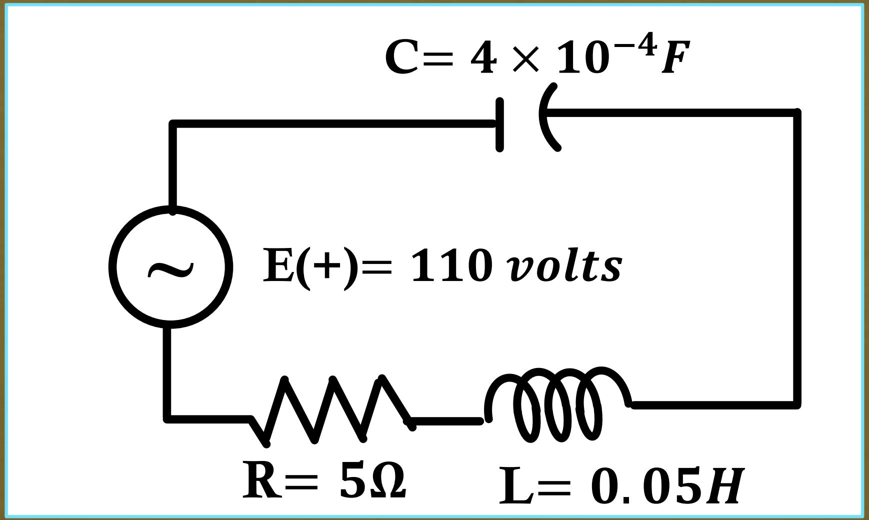
$$L\frac{d^2i}{dt^2}+R\frac{di}{dt}+\frac{i}{C}=\frac{dE}{dt} \quad \text{- - - - -} \quad (\text{iii})$$

Thus the charge q and current i at any time in L – C – R circuits are obtained from (ii) and (iii) which are second order linear differential equation with constant coefficients.

On the same line we can obtain the differential equation in the form of dependent variable i , for the L – C circuits given in figure (a) and figure (b)

Example :- A circuit consist of an inductance of 0.05 $henrys$, a resistance 5 $ohms$ and condenser of capacitance 4×10^{-4} $farad$. If $q = i = 0$ when $t = 0$, find q and i when there is a constant e.m.f. of 110 $volts$.

Solution :-



We know the voltage drop across L , C and R are respectively

$L = \frac{d^2q}{dt^2}$, $\frac{q}{C}$ and $R\frac{dq}{dt}$

Thus by Kirchhoff's voltage law , we have

$$L\frac{d^2i}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = E(t) \quad \text{------} \quad (\text{ i })$$

Here $L = 0.05\ H$, $R = 5\Omega$, $C = 4 \times 10^{-4}\ F$ and $E(t) = 110\ volts$

Thus the equation (i) becomes

$$0.05\frac{d^2q}{dt^2} + 5\frac{dq}{dt} + \frac{q}{4 \times 10^{-4}} = 110$$

$$\Rightarrow \frac{d^2q}{dt^2} + 100\frac{dq}{dt} + 50000q = 20(110) = 2200 \quad \text{------} \quad (\text{ ii })$$

Let $\frac{d}{dt} \equiv D$, then equation (ii) can be written as $(D^2 + 100D + 50000)q = 2200$

The A.E. is $D^2 + 100D + 50000 = 0$

$$D = \frac{-100 \pm \sqrt{(100)^2 - 4(1)50000}}{2(1)}$$

$$= \frac{-100 \pm \sqrt{-19,0000}}{2}$$

$$= \frac{-100 \pm i\ 100\sqrt{19}}{2}$$

$$= -50 \pm i\ 50\sqrt{19}$$

$$C.F. = e^{-50t}\left[C_1 \cos\left(50\sqrt{19}\right)t + C_2 \sin\left(50\sqrt{19}\right)t\right]$$

And $$P.I. = \frac{1}{D^2+100D+50000} 2200$$

$$= \frac{1}{D^2 + 100D + 50000} 2200\, e^{0t}$$

$$= \frac{1}{50000} 2200$$

$$P.I = \frac{11}{250}$$

The complete solution is

$$q = C.F. + P.I$$

$$q = e^{-50t}\left[C_1 \cos\left(50\sqrt{19}\right)t + C_2 \sin\left(50\sqrt{19}\right)t\right] + \frac{11}{250} \quad \text{------} \quad (\text{ iii })$$

Differentiating Eq. (iii) w.r.t. t and using $i = \frac{dq}{dt}$, we get

$$i = e^{-50t}\left[-50\sqrt{19}\ C_1 \sin\left(50\sqrt{19}\ t\right) + 50\sqrt{19}\ C_2 \cos(50\sqrt{19}\ t)\right]$$
$$+(-50)e^{-50t}\left[\ C_1 \cos\left(50\sqrt{19}\ t\right) + C_2 \sin(50\sqrt{19}\ t)\right] \quad \text{- - - - - (iv)}$$

Given $q = 0$, $i = 0$ when $t = 0$

$$q = e^{-50t}\left[C_1\ a\cos\left(50\sqrt{19}\right)t + C_2 \sin\left(50\sqrt{19}\right)t\right] + \frac{11}{250}$$

Thus from Eq. (iii) , we get

$$0 = C_1 + \frac{11}{250} \quad , \quad C_1 = -\frac{11}{50}$$

and from Eq. (iv) we get

$$0 = 50\sqrt{19}\ C_2 + C_1(-50)$$
$$= 50\sqrt{19}\ C_2 + \left(-\frac{11}{50}\right)(-50) \quad = \sqrt{19}\ C_2 + \frac{11}{250} \quad C_2 = -\frac{11}{250\sqrt{19}}$$

Thus From (iii) , we have

$$q = e^{-50t}\left[C_1\, a\cos\left(50\sqrt{19}\right)t + C_2 \sin\left(50\sqrt{19}\right)t\right] + \frac{11}{250}$$

$$q = e^{-50t}\left[-\frac{11}{250}\cos\left(50\sqrt{19}\,t\right) - \frac{11}{250\sqrt{19}}\sin\left(50\sqrt{19}\,t\right)\right] + \frac{11}{250}$$

And From (iv) , we have

$$i = e^{-50t}\left[-50\sqrt{19}\, C_1 \sin\left(50\sqrt{19}\,t\right) + 50\sqrt{19}\, C_2 \cos(50\sqrt{19}\,t)\right]$$
$$+ (-50)e^{-50t}\left[C_1 \cos\left(50\sqrt{19}\,t\right) + C_2 \sin(50\sqrt{19}\,t)\right]$$

$$i = e^{-50t}\left[-\frac{11\sqrt{19}}{5}\sin\left(50\sqrt{19}\,t\right) - \frac{11}{5}\cos\left(50\sqrt{19}\,t\right)\right] +$$
$$e^{-50t}\left[\frac{11}{5}\cos\left(50\sqrt{19}t\right) + \frac{11}{5\sqrt{19}}\sin\left(50\sqrt{19}t\right)\right]$$

Example :- An unchanged condenser of capacity C is charged by applying an $e.m.f.\ E\sin\left(\frac{t}{\sqrt{LC}}\right)$, through lead of self inductance L and negligible resistance. Prove that at time t, the charge on one of the plates is $\frac{EC}{2}\left[\sin\left(\frac{t}{\sqrt{LC}}\right)-\frac{t}{\sqrt{LC}}\cos\left(\frac{t}{\sqrt{LC}}\right)\right]$

Solution :- we know that voltage drop across condenser and inductor are $L\frac{d^2q}{dt^2}$ and $\frac{q}{C}$ respectively.

The total e.m.f. is given $E\sin\left(\frac{t}{\sqrt{LC}}\right)$

$\therefore$ By Kirchhoff's voltage law, we have $L\frac{d^2q}{dt^2}+\frac{q}{C}=E\sin\left(\frac{t}{\sqrt{LC}}\right)$

$$\therefore \quad \frac{d^2q}{dt^2}+\frac{1}{LC}q=\frac{E}{L}\sin\left(\frac{t}{\sqrt{LC}}\right) \qquad \text{- - - - - (i)}$$

Let $\frac{d}{dt} = D$, then (i) becomes $(D^2 + w^2)q = \frac{E}{L}\sin wt$, where $W = \frac{1}{\sqrt{LC}}$

The A.E. is $D^2 + w^2 = 0 \quad \Rightarrow D = \pm iw$

$\therefore \quad C.F. = C_1 \cos wt + C_2 \sin wt$

$$\therefore \quad P.I. = \frac{1}{D^2 + w^2} \frac{E}{L} \sin wt$$

$$= \frac{E}{L} \frac{t}{2D} \sin wt$$

$$P.I = \frac{E}{L} \frac{t}{2}\left(-\frac{\cos wt}{w}\right)$$

The complete solution is

$q = C.F. + P.I.$

$$q = C_1 \cos wt + C_2 \sin wt - \frac{E}{2Lw} t \cos wt \quad \text{- - - - -} \quad (\text{ii})$$

$$i = \frac{dq}{dt}$$

$$= -C_1 w \sin wt + C_2 w \cos wt - -\frac{E}{2LW}[-t(w) \sin wt + \cos wt] \text{- - - - -} \quad (\text{iii})$$

Given that $q = 0$ and $i = 0$ at $t = 0$.

Thus from Eq. (ii) we have $0 = C_1$ and from Eq.(iii) we have

$$0 = C_2 w - \frac{E}{2Lw} \qquad \Rightarrow C_2 = \frac{E}{2Lw^2}$$

The Eq. (ii) becomes

$$q = \frac{E}{2Lw^2} \sin wt - \frac{E}{2Lw} t \cos wt$$

$$= \frac{E}{2Lw^2}[\sin wt - wt \cos wt]$$

As $w = \frac{1}{\sqrt{LC}}$, $w^2 = \frac{1}{LC}$, we have

$$q = \frac{EC}{2}\left[\sin\left(\frac{t}{\sqrt{LC}}\right) - \frac{t}{\sqrt{LC}}\cos\left(\frac{t}{\sqrt{LC}}\right)\right]$$

Regression : It is the method of estimating the value of one variable when that of the other is known and the variables are correlated.

Line of regression of y on x :: It is the line which gives the best estimate for the values of y for any given value of x.

This regression equation of y on x is given by

$$y - \bar{y} = r \frac{\sigma_y}{\sigma_x} (x - \bar{x})$$

where is coefficient of correlation between the variables x, y

$$\sigma_x = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n}} \qquad \sigma_y = \sqrt{\frac{\sum_{i=1}^{n} (y_i - \bar{y})^2}{n}}$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad \bar{y} = \frac{\sum_{i=1}^{n} y_i}{n}$$

$$r = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2 \sum_{i=1}^{n} (y_i - \bar{y})^2}}$$

, the coefficient of correlation between x, y

The line of regression of y on x also can be written as

$$y = bx + c$$

The line of regression of x on y is given by

$(\bar{x}, \bar{y})$

$$x - \bar{x} = r \frac{\sigma_x}{\sigma_y} (y - \bar{y})$$

It is the line which gives the best estimate for the values of x for any given value of y.

It is can be written as

$$x = a + by$$

In these regression equations $\bar{x}$ and $\bar{y}$ are means of the x series & y series respectively

The line regression is line of best fit and is obtained by the principle of least squares.

Regression coefficient of y on x:

The slope b of the line of regression of y on x is called as coefficient of regression of y on x. It represents the increment in the value of y corresponding to a unit change in the value of x

It is represented by

$$b_{yx} = \text{Regression coefficient of } y \text{ on } x = r\frac{\sigma_y}{\sigma_x}$$

Similarly the slope b of line of regression of x on y is called the coefficient of regression of x on y and is represented by

$$b_{xy} = r\frac{\sigma_x}{\sigma_y}$$

* $b_{xy} \cdot b_{yx} = r^2$

$r = \pm\sqrt{b_{xy} \cdot b_{yx}}$

r will be negative if the both coefficients are negative

r will be +ve if the both coefficients are positive

* $-1 \le r \le 1$

Expressions for regression coeffs:

$$b_{yx} = r\frac{\sigma_y}{\sigma_x} = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2}$$

$$b_{xy} = r\frac{\sigma_x}{\sigma_y} = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(y-\bar{y})^2}$$

* $$r = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{n}}\sqrt{\sum y^2 - \frac{(\sum y)^2}{n}}}$$, $\sigma_x = \sqrt{\sum x^2 - \frac{(\sum x)^2}{n}}$

$\sigma_y = \sqrt{\sum y^2 - \frac{(\sum y)^2}{n}}$

$$b_{yx} = r\frac{\sigma_y}{\sigma_x} = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}}$$

$$b_{xy} = r\frac{\sigma_x}{\sigma_y} = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum y^2 - \frac{(\sum y)^2}{n}}$$

* If $b_{yx} > 1$ then $b_{xy} < 1$ if $r^2 \le 1$ $r^2 = b_{yx} b_{xy} \le 1$

$\Rightarrow b_{yx} \le \frac{1}{b_{xy}}$

Regression coefficients are independent of the change of the origin but not of scale.

→ $d_x = \frac{x-a}{h}$, $d_y = \frac{y-b}{k}$

$x = a + hd$ $\quad y = b + kd$, $a, b, h\ (>0)$ & $k\ (>0)$ are constants

$r_{d_x d_y} = r_{xy}$, $\sigma^2_{d_x} = \frac{1}{h^2}\sigma_x^2$, $\sigma^2_{d_y} = \frac{1}{k^2}\sigma_y^2$

$b_{d_x d_y} = r_{d_x d_y} \cdot \frac{\sigma_{d_y}}{\sigma_{d_x}} = \frac{k}{h} b_{xy}$

$b_{d_y d_x} = \frac{h}{k} b_{yx}$

* Both regression coefficients will have same sign ie either both are positive or both are negative.
* $r > 0$ if $b_{xy} > 0$ $b_{yx} > 0$
* $r < 0$ if $b_{xy} < 0$ $b_{yx} < 0$
* $r = 0$, these lines of regression are ⊥er to each other
* The lines of regressions passes through the point $(\bar{x}, \bar{y})$

Ex: The regression lines of sample are $x + 6y = 6$ & $3x + 2y = 10$.

Find i) Sample means $\bar{x}$ and $\bar{y}$

ii) The coefficient of correlation betn x, y

iii) Also estimate y when $x = 12$

→ ∵ The lines of regression passes the point $(\bar{x}, \bar{y})$

we have $\bar{x} + 6\bar{y} = 6$ —— (I)

$3\bar{x} + 2\bar{y} = 10$ —— (II)

$3 \times$ eqn (I) $-$ eqn (II)

$3\bar{x} + 18\bar{y} - 3\bar{x} - 2\bar{y} = 18 - 10$

$16\bar{y} = 8$ $\quad \therefore \bar{y} = \frac{1}{2}$

$\therefore \bar{x} = 6 - 6\bar{y} = 6 - \frac{6}{2} = 6 - 3 = 3$

$\bar{x} = 3, \ \bar{y} = \frac{1}{2}$

(ii) Let the $x + 6y = 6$ be the line of regression of x on y

$x = -6y + 6$

regression coefficient of x on y $= -6 = b_{xy}$

& the line regression of y on x be $3x+2y=10$

$\therefore$ $2y = -3x+10$

$y = -\frac{3}{2}x+5$

$\therefore$ regression coefficient of y on x $= b_{yx} = -\frac{3}{2}$

$r^2 = b_{xy}\, b_{yx} = (-6)(-\frac{3}{2}) = 9$

$r = \pm 3$ but $-1 \le r \le 1$

our choice of regressions lines is wrong

So we change our choice of regression lines

Let the $x+6y=6$ be the line of regression of y on x

$y = -\frac{x}{6}+1$

regression coefficient of y on x $= -\frac{1}{6} = b_{yx} < 0$

Let the $3x+2y=10$ be the line of regression of x on y

$x = -\frac{2}{3}y+\frac{10}{3}$

regression coefficient of x on y $= -\frac{2}{3} = b_{xy} < 0$

Now $r^2 = b_{xy}\, b_{yx} = (-\frac{1}{6})(-\frac{2}{3}) = \frac{2}{18} = \frac{1}{9}$

$r = \pm\frac{1}{3}$ (which is in the range $-1 \le r \le 1$)

but $b_{yx} < 0$, $b_{xy} < 0$

$\therefore$ $r = -\frac{1}{3}$ ie x, y are negatively linearly correlated.

Instrumentation Engineering Department
Government College of Engineering, Jalgaon

ONLINE CLASS 1: DIGITAL IMAGE PROCESSING

Date: 11/08/2020

Course Teacher,

Miss. PRIYANKA A KHARCHE

Course Name

DIGITAL IMAGE PROCESSING (IN401)

SYLLABUS:-

Course Content

Digital Image Fundamentals

Introduction to image processing, digital image representation, pixel, intensity, gray level, brightness, contrast, steps in image processing, elements of DIP system, elements of visual perception, simple image formation model, colour model, sampling and quantization, imaging geometry, 2D linear convolution, 2D circular convolution, 2D correlation.

Image Transforms

Introduction to image transforms and itøs need, classification of image transform, 2D Discrete Fourier Transform and properties, FFT (Decimation in time and Decimation in frequency technique), Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Wavelet Transform..

Image Enhancement

Image enhancement by point processing operations- Histogram and histogram equalization, contrast stretching, thresholding, image negative, intensity level slicing, bit extraction, range compression, gamma correction, image arithmetic, Spatial filtering- Low-pass filter, weighted averaging filter, median filter, high-pass filter, Bartlett filter, Gaussian filter, Frequency domain methods- Low-pass and high-pass Butterworth filter, low-pass and high-pass Gaussian filter, homomorphic filter.

Image Restoration and Image Segmentation

Image restoration-degradation model, Linear image restoration techniques, Non-linear image restoration techniques, Blind deconvolution, Image denoising.

Image segmentation- Region approach to image segmentation, clustering techniques, segmentation based on thresholding, edge-based segmentation, edge linking, Watershed transformation.

Image Compression

Need for image compression, types of redundancies, Run length coding, Shannon-Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transform based compression, Image compression standards, Scalar and vector quantization.

Text Books:

1. Digital Image Processing, R. C. Gonzalez and R. E. Woods, Pearson Education, 3rd edition, 2008.
2. Fundamentals of Digital Image Processing, Anil K. Jain, Prentice Hall India, 2010.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan and T. Veerakumar, McGraw Hill Publication, 2012.

Reference Books:

1. Image Processing, Analysis and Machine Vision, M. Sonka, V. Hlavac and R. Boyle, Thomson Learning, 2nd edition, 2001.
2. Digital Image Processing, Kenneth Castleman, Pearson Education, 2006.

UNIT1:- DIGITAL IMAGE FUNDAMENTALS

Digital Image Processing

INTRODUCTION

Processing of images which are digital in nature by a Digital Computer

•Why do we need Image Processing?

- It is motivated by two major applications-

1. Improvement of pictorial information for human perception.
2. Image Processing for autonomous machine application.
3. Efficient storage and transmission

Human Perception:-

- Employ methods capable of enhancing pictorial information for human interpretation and analysis:

❑ Typical applications:

- Noise Filtering
- Content enhancement
    - i) Contrast Enhancement
    - ii) Deblurring
- Remote Sensing

Filtering:-

Noisy Image

Filtered Image

Image Enhancement:-

Low contrast Image Enhanced Image

Image Enhancement:-

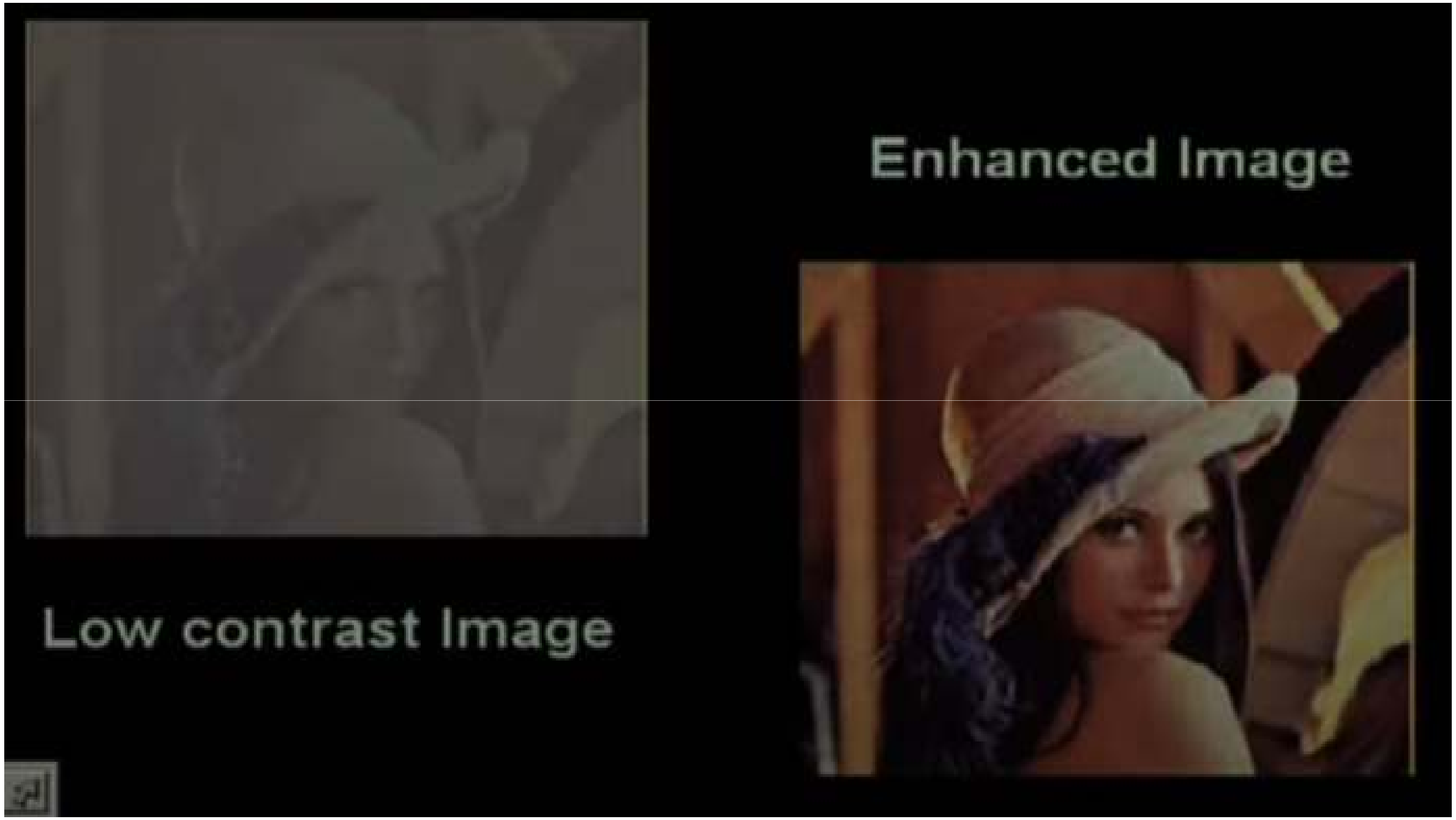
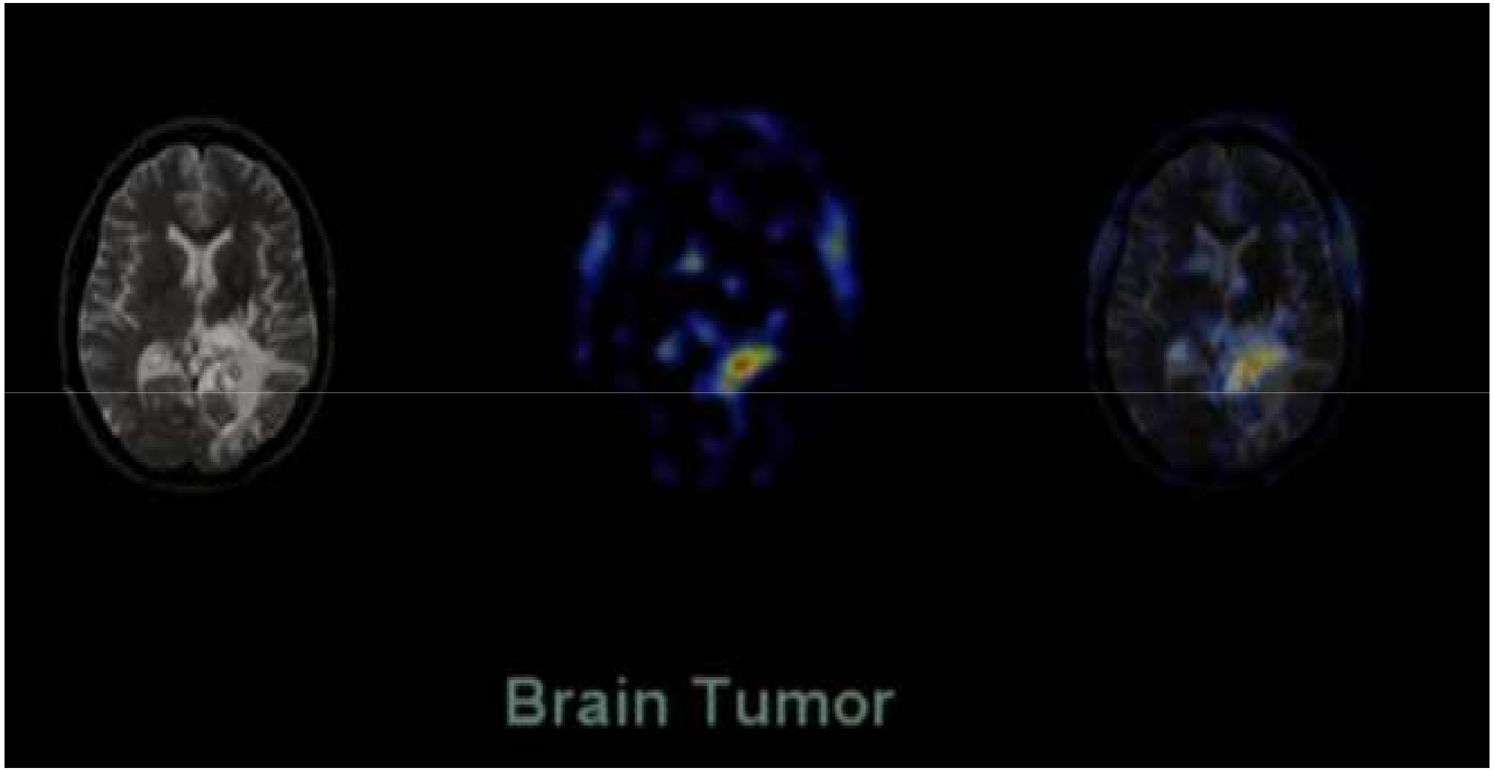
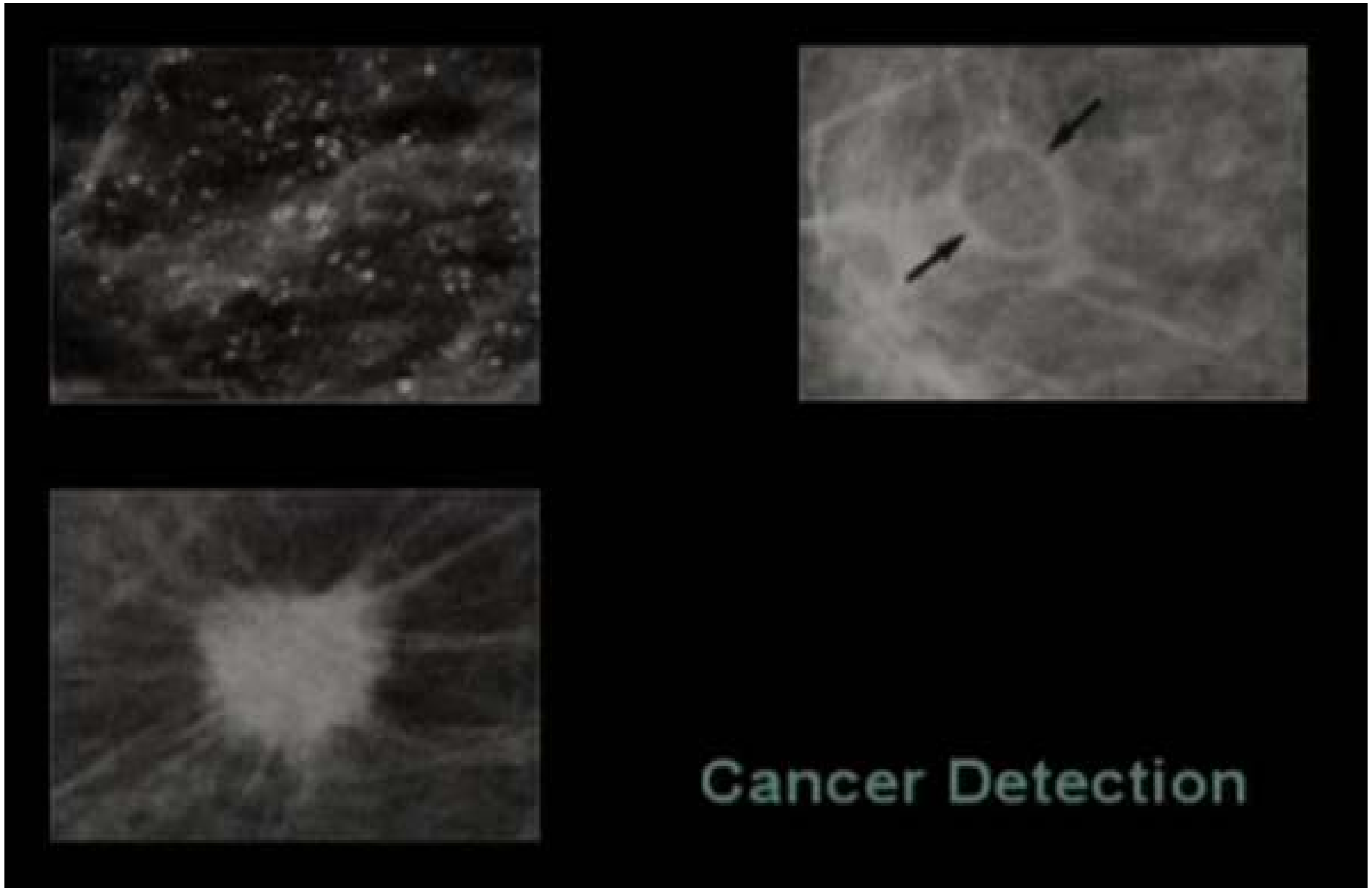


Image Deblurring:-

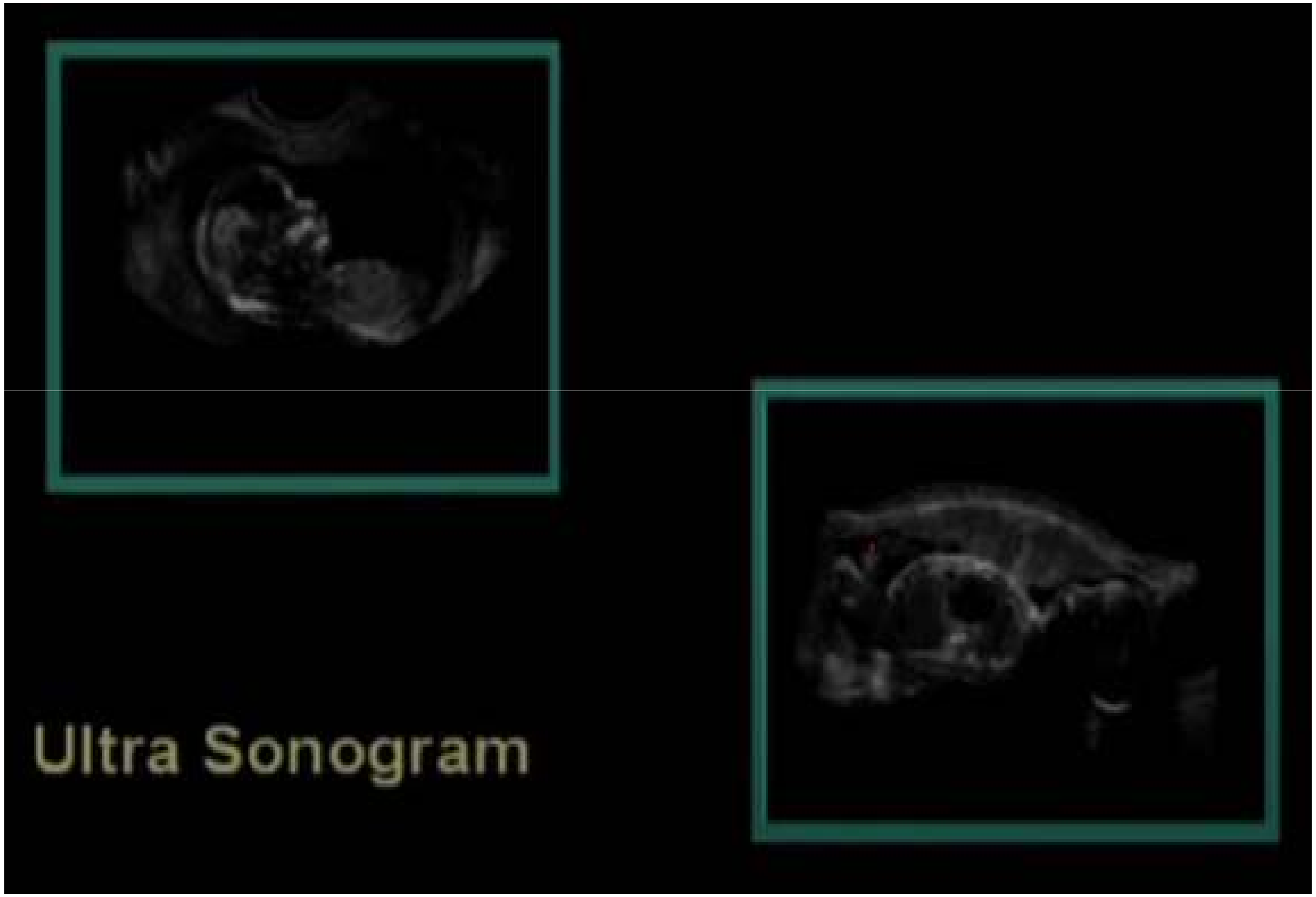
Medical Imaging:-



Medical Imaging:-



Medical Imaging:-



Remote Sensing:-

Remote Sensing:-

THANK YOU…..

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Upcoming
No work due in soon
View all

Announce something to your class

Sunil Ahirrao posted a new assignment: Audit course submission
6 Aug 2021 (Edited 6 Aug 2021)

Sunil Ahirrao posted a new assignment: Anti–ragging form registration and declaration
8 Apr 2021 (Edited 8 Apr 2021)

Classroom > GCOEJ: S. Y. B. Tech(2021)
Civil Engineering

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Sunil Ahirrao posted a new assignment: complimentary MSE :SH296U (Advance ... 1 student
24 Jul 2021

Sunil Ahirrao posted a new assignment: Surprise Test
7 May 2021

Sunil Ahirrao posted a new assignment: MSE April 2021: S.Y.B.Tech.Civil (AEM)

16 Apr 2021 (Edited 17 Apr 2021)

Civil Engineering Department ICT Tools used proofs

Sr. No.	Topic	Youtube video lecture link
Course : CE351U (ADVANCED THEORY OF STRUCTURES)		
1	Basic Concepts of Structural Analysis	https://www.youtube.com/watch?v=JPFdrMftdao&list=PLgWHReJ5o_K3EEyJiLCY76erSoWUa7PBn https://www.youtube.com/watch?v=x7HPZ5IZixE&list=PLgWHReJ5o_K3EEyJiLCY76erSoWUa7PBn&index=2
2	Slope Deflection Method	https://www.youtube.com/watch?v=gTXQ35j1Qoo&list=PLgWHReJ5o_K3xOmVQYNLgy1y39apzeozt
3	Moment Distribution Method	https://www.youtube.com/watch?v=09BmYDmyHO0&list=PLgWHReJ5o_K35M3Fme9fkqjIij0WMO2SA
4	Kani's, moment distribution	https://www.youtube.com/watch?v=aP2uuW2L3xk&list=PLgWHReJ5o_K0AIVa9GdfhbZdJb96uNZyD
5	Stiffness matrix method	https://www.youtube.com/watch?v=Y6QOqjAFI20&list=PLgWHReJ5o_K2njIjHWdK_0gOVOe068k1e
Course: CE404UB (Professional Elective –III Advanced Reinforced Cement Concrete)		

1	**Design of Combined footing**	https://www.youtube.com/watch?v=r_OCzx_IzV8&list=PLgWHReJ5o_K1Vd_eeeWw7X76OPys6KPSH https://www.youtube.com/watch?v=A-wPCbUiANo&list=PLgWHReJ5o_K1Vd_eeeWw7X76OPys6KPSH&index=2 https://www.youtube.com/watch?v=y263aNLXIRE&list=PLgWHReJ5o_K1Vd_eeeWw7X76OPys6KPSH&index=3 https://www.youtube.com/watch?v=pb-yfJPUujE&list=PLgWHReJ5o_K1Vd_eeeWw7X76OPys6KPSH&index=4 https://www.youtube.com/watch?v=pb-yfJPUujE&list=PLgWHReJ5o_K1Vd_eeeWw7X76OPys6KPSH&index=4 https://www.youtube.com/watch?v=p_OIyV76k3c&list=PLgWHReJ5o_K1Vd_eeeWw7X76OPys6KPSH&index=5 https://www.youtube.com/watch?v=N74E1hBai1M&list=PLgWHReJ5o_K1Vd_eeeWw7X76OPys6KPSH&index=6

2	**Design of Flat Slab**	https://www.youtube.com/watch?v=CUZk45jLtkw&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=9&pp=gAQBiAQB https://www.youtube.com/watch?v=R1e-8DleKFA&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=10&pp=gAQBiAQB https://www.youtube.com/watch?v=mGQLCCN8AuQ&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=11&pp=gAQBiAQB https://www.youtube.com/watch?v=CFQSwTRe25c&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=12&pp=gAQBiAQB https://www.youtube.com/watch?v=OLnYAoaujE4&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=13&pp=gAQBiAQB https://www.youtube.com/watch?v=v0y8uc3syFQ&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=14&pp=gAQBiAQB https://www.youtube.com/watch?v=y04Ta1_t81M&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=15 https://www.youtube.com/watch?v=e4c2bRXk2YI&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=16 https://www.youtube.com/watch?v=hR95DG1881U&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=17

3	**RETAIINING WALLS**	https://www.youtube.com/watch?v=Q4vMrRypApM&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=18 https://www.youtube.com/watch?v=XsYeMM9Rtqo&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=20 https://www.youtube.com/watch?v=Kiece700v_c&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=21 https://www.youtube.com/watch?v=tmhqlDuh53M&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=22 https://www.youtube.com/watch?v=PioF9QB3ysQ&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=23 https://www.youtube.com/watch?v=TmzNh_a7vX0&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=24 https://www.youtube.com/watch?v=7eQIj_U7Ac0&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=25 https://www.youtube.com/watch?v=fu8t9hPeRhs&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=26

4	**Design of Water tank with flexible base / fixed base**	https://www.youtube.com/watch?v=fu8t9hPeRhs&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=26 https://www.youtube.com/watch?v=fu8t9hPeRhs&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=26 https://www.youtube.com/watch?v=3QW5fbCpUiE&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=27 https://www.youtube.com/watch?v=AwGa877Wnaw&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=28 https://www.youtube.com/watch?v=MnGwG1YEK1A&list=PLHUa7iJnccyO28yRplzSCXd6_Z-uvd_nX&index=29