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MODULE NO -1

FOURIER SERIES AND PRACTICAL HARMONIC ANALYSIS

1. Obtain the Fourier expansion of $f(x) = \frac{1}{2}(\pi - x)$ *in the interval* $-\pi < x < \pi$

2. Obtain the Fourier expansion of $f(x) = e^{-ax}$ in the interval $(-\pi, \pi)$

   and deduce that $\operatorname{cosech}\pi = \frac{2}{\pi}\sum_2^\infty \frac{(-1)^n}{n^2+1}$

3. Obtain the Fourier expansion of $f(x) = x - x^2$ over the interval $(-\pi, \pi)$

   and deduce that $\frac{\pi^2}{12} = 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} \cdots\cdots\cdots$

4. Obtain the Fourier expansion of $f(x) = x^2$ over the interval $(-\pi, \pi)$

   and deduce that $\frac{\pi^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} \cdots\cdots\cdots$

5. Obtain the Fourier expansion of $f(x) = \begin{cases} x, & 0 \le x \le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}$

   Deduce that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots\cdots\cdots$

6. Obtain the Fourier expansion of $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$

   Deduce that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots\cdots\cdots$

7. Obtain the Fourier expansion of $f(x) = x\sin x$ over the interval $(0, 2\pi)$

8. Expand $f(x) = \sqrt{1 - \cos x},\ 0 < x < 2\pi$ in a Fourier series, hence evaluate $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \cdots\cdots$

9. If $f(x) = \begin{cases} 0, & -\pi < x < 0 \\ \sin x, & 0 < x < \pi \end{cases}$, prove that $f(x) = \frac{1}{\pi} + \frac{\sin x}{2} - \frac{2}{\pi}\sum_1^\infty \frac{\cos 2nx}{4n^2-1}$,

   Hence show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \cdots\cdots = \frac{1}{4}(\pi - 2)$.

10. Find the Fourier series for the function $f(t) = \begin{cases} -1 & \text{for } -\pi < t < -\frac{\pi}{2} \\ 0 & \text{for } -\frac{\pi}{2} < t < \frac{\pi}{2} \\ 1 & \text{for } \frac{\pi}{2} < t < \pi \end{cases}$

11. Obtain the Fourier series for the function $f(x) = \begin{cases} x, & 0 \le x \le \pi \\ (x - 2\pi) & \pi \le x \le 2\pi \end{cases}$.

    And deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} \cdots$

12. Obtain the Fourier series of $f(x) = 1 - x^2$ over the interval $(-1, 1)$

13. Obtain the Fourier expansion of $f(x) = \begin{cases} 1 + \frac{4x}{3}, & -\frac{3}{2} < x \le 0 \\ 1 - \frac{4x}{3}, & 0 \le x < \frac{3}{2} \end{cases}$

    Deduce that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots\cdots\cdots$

14. Obtain the Fourier expansion of $f(x) = \frac{(\pi - x)}{2} \quad in\ 0 < x < 2\pi$

    Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots\cdots$

15. Expand $f(x) = x(\pi - x)$ as half-range sine series over the interval $(0, \pi)$

16. Obtain the cosine series of $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$ over $(0, \pi)$

17. Obtain the half-range cosine series of $f(x) = c - x$ in $0 < x < c$

18. Obtain the Fourier expansion of $x \sin x$ as a cosine series in $(0, \pi)$

    Hence show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \cdots\cdots = \frac{\pi - 2}{4}$

19. Expand $f(x) = \begin{cases} \frac{1}{4} - x, & if\ 0 < x < \frac{1}{2} \\ x - \frac{3}{4}, & if\ \frac{1}{2} < x < 1 \end{cases}$, as the Fourier series of sine terms.

20. Obtain the Fourier cosine series for $f(x) = x(l - x)$ in the range $0 \le x \le l$

21. Obtain the Fourier series of the following functions over the specified intervals:

    a) $f(x) = x + \frac{x^2}{4} \quad over\ (-\pi, \pi)$

    b) $f(x) = |x| \quad over\ (-\pi, \pi)$; Deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} \cdots\cdots$

    c) $f(x) = \begin{cases} \pi + x, & -\pi \le x < 0 \\ \pi - x, & 0 \le x < \pi \end{cases}, \quad over\ (-\pi, \pi).$

    Deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} \cdots\cdots$

    d) $f(x) = x(2 - x) \quad over\ (0,3)$

    e) $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2 - x), & 1 \le x \le 2 \end{cases}$

22. Obtain the half-range sine series of the following functions over the specified intervals:

a) $f(x) = \cos x \quad over\ (0, \pi)$

b) $f(x) = \sin^3 x \quad over\ (0, \pi)$

c) $f(x) = lx - x^2 \quad over\ (0\ , l)$

23. Obtain the half-range cosine series of the following functions over the specified intervals:

a) $f(x) = x^2\ over\ (0, \pi)$

b) $f(x) = x \sin x \quad over\ (0, \pi)$

c) $f(x) = \begin{cases} kx, & 0 \le x \le \frac{l}{2} \\ k(l-x), & \frac{l}{2} \le x \le l \end{cases}$

24. Express $f(x)$ as Fourier series upto second harmonics for the given table.

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
$f(x)$	1.0	1.4	1.9	1.7	1.5	1.2	1.0

25. Express y as a Fourier series upto the third harmonic given the following values:

x	0	1	2	3	4	5
y	4	8	15	7	6	2

26. Find the constant term and first harmonic terms of the Fourier series of y from the following

table

x	0	1	2	3	4	5
y	9	18	24	28	26	20

27. The following table gives the variations of a periodic current A over a period :

t(secs)	0	T/6	T/3	T/2	2T/3	5T/6	T
A (amp)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Show that there is a constant part of 0.75amp. in the current A and obtain the amplitude of the first harmonic

28. The displacement y of a part of a mechanism is tabulated with corresponding angular movemen x^o of the crank. Express y as a Fourier series upto the first harmonic.

x^o	0	30	60	90	120	150	180	210	240	270	300	330
y	1.80	1.10	0.30	0.16	1.50	1.30	2.16	1.25	1.30	1.52	1.76	2.00

29. Obtain the Fourier series of y up to the second harmonic using the following table:

x^o	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	-1.5	0	2.8	3.4

30. Obtain the constant term and the coefficients of the first sine and cosine terms in the Fourier expansion of y as given in the following table:

x	0	1	2	3	4	5
y	9	18	24	28	26	20

31. The turning moment T is given for a series of values of the crank angle θ^0.

θ^0	0	30	60	90	120	150	180
T	0	5224	8097	7850	5499	2626	0

Obtain the first four terms in a series of sine's to represent T and calculate T at $\theta = 75^0$.

MODULE -02

FOURIER TRANSFORM (INFINITE/COMPLEX FOURIER TRANSFORM)

1) Find the Complex Fourier Transform of the function $f(x) = \begin{cases} 1 & for\ |x| \le a \\ 0 & for\ |x| > a \end{cases}$

   and hence P.T $\int_0^\infty \frac{\sin x}{x}\, dx = \frac{\pi}{2}$

2) Find the Complex Fourier Transform of the function $f(x) = \begin{cases} x & for\ |x| \le \alpha \\ 0 & for\ |x| > \alpha \end{cases}$

   where α is a positive constant.

3) Find the Fourier Transform of the function $f(x) = \begin{cases} 1 - x^2 & for\ |x| \le 1 \\ 0 & for\ |x| > 1 \end{cases}$

   and hence evaluate $(i)\ \int_0^\infty \frac{x \cos x - \sin x}{x^3}\, dx$ $(ii)\ \int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos(\frac{x}{2}) dx$

4) Find the Fourier Transform of the function $f(x) = e^{-|x|}$

5) Find the Fourier Transform of the function $f(x) = \begin{cases} 1-|x| & for\ |x| \le 1 \\ 0 & for\ |x| > 1 \end{cases}$
and hence deduce that $\int_0^\infty \frac{\sin^2 t}{t^2}\,dt = \frac{\pi}{2}$

6) Find the Complex Fourier Transform of the function $f(x) = \begin{cases} x^2 & for\ |x| \le a \\ 0 & for\ |x| > a \end{cases}$
where a is a positive constant.

7) Find the Fourier Transform of the function $f(x) = x\,e^{-|x|}$

8) Find the Fourier Transform of the function $f(x) = \begin{cases} 1+\left(\frac{x}{a}\right), & -a < x < 0 \\ 1-\left(\frac{x}{a}\right), & 0 < x < a \\ 0\ , & Otherwise \end{cases}$

9) Find the Complex Fourier Transform of $f(x) = e^{-a^2x^2}$ where $a > 0$. Hence deduce that $e^{-x^2/2}$ is self-reciprocal in respect of the Complex Fourier Transform.

10) Find the Inverse Fourier Transform of $f(x) = e^{-u^2}$

11) Find the Fourier Transform of $f(x) = \begin{cases} e^{-x} & for\ x > 0 \\ -e^{x} & for\ x < 0 \end{cases}$

12) Find the Fourier Transform of the function $f(x) = \begin{cases} a^2 - x^2 & for\ |x| \le a \\ 0 & for\ |x| > a \end{cases}$
and hence deduce that $\int_0^\infty \frac{\sin x - x\cos x}{x^3}\,dx = \frac{\pi}{4}$

13) Find the Fourier Transform of the function $f(x) = \begin{cases} 1+x, & -1 < x < 0 \\ 1-x, & 0 < x < 1 \\ 0\ , & Otherwise \end{cases}$

FOURIER SINE AND COSINE TRANSFORMS

1) Find the Fourier Sine and Cosine Transform of the function $f(x) = \begin{cases} x, & 0 < x < 2 \\ 0\ , & elsewhere \end{cases}$

2) Find the Fourier Sine and Cosine Transform of the function $f(x) = e^{-\alpha x}\ where\ \alpha > 0$

3) Find the Fourier Cosine Transform of the function $f(x) = \begin{cases} 4x, & 0 < x \leq 1 \\ 4-x, & 1 < x \leq 4 \\ 0\ , & x > 4 \end{cases}$

4) Find the Infinite Fourier Cosine Transform of $f(x) = e^{-x^2}$

5) Find the Fourier Sine Transform of the function $f(x) = e^{-|x|}\ where\ x > 0$ and hence evaluate $\int_0^\infty \frac{x\ sin\ mx}{1+x^2}\ dx \quad where\ m > 0$

6) Find the Fourier Sine Transform of the function $f(x) = \begin{cases} x, & 0 < x \leq 1 \\ 2-x, & 1 < x \leq 2 \\ 0\ , & x > 2 \end{cases}$

7) Find the Fourier Cosine Transform of the function $f(x) = \begin{cases} x, & 0 < x \leq 1 \\ 2-x, & 1 < x \leq 2 \\ 0\ , & x > 2 \end{cases}$

8) Find the Fourier Cosine Transform of the function $f(x) = e^{-|x|}\ where\ x > 0$ and hence evaluate $\int_0^\infty \frac{cos\ xt}{1+t^2}\ dt$

9) Find the Fourier Sine and Cosine Transform of the function $f(x) = 2e^{-3x} + 3e^{-2x}$

INTEGRAL EQUATIONS

1) Solve the integral equation $\int_0^\infty f(\theta)\ cos\ \alpha\theta\ \ d\theta = \begin{cases} 1-\alpha, & 0 \leq \alpha \leq 1 \\ 0, & \alpha > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{sin^2\ t}{t^2}\ dt$

2) Solve the integral equation $\int_0^\infty f(x)\ cos\ sx\ \ dx = \begin{cases} 1-s, & 0 \leq s \leq 1 \\ 0, & s > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{1-cosx}{x^2}\ dx = \frac{\pi}{2}$

MODULE-3 : Z-Transform

1) Find the Z-transform of n^2
2)Find the Z-transform of $(n+1)^2$
3) Find the Z-transform of $sin(3n+5)$

4)Find the Z-transform of 2n + sin $\left(\frac{n\pi}{4}\right) + 1$.

5)Find the Z-transform of cos $\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$

6) Find the Z-transform of $cosn\theta$.

7) Find the Z-transform of $sinn\theta$.

8) Find the Z-transform of $e^{-an}sinn\theta$.

9) Find the Z-transform of $e^{-an}cosn\theta$.

10) Find the Z-transform of $coshn\theta$.

11) Find the Z-transform of $sinhn\theta$.

12)If $u_n = (\frac{1}{2})^n$ P.T $Z_T(u_n) = \frac{2z}{2z-1}$.

13)If $Z_T(u_n) = \frac{z}{z-1} + \frac{z}{z^2+1}$ find $Z_T(u_{n+2})$.

14)If $Z_T(u_n) = \frac{2z^2+5z+14}{(z-1)^2}$ find u_2 & u_3.

15) If $Z_T(u_n) = \frac{2z^2+3z+12}{(z-1)^4}$ find u_0 , u_1 , u_2 & u_3.

16) Obtain the inverse z – transform of $\frac{4z^2-2z}{z^3-5z^2+8z-4}$.

17) Obtain the inverse z – transform of $\frac{z}{z^2+7z+10}$.

18) Obtain the inverse z – transform of $\frac{2z^2+3z}{(z+2)(z-4)}$.

19) Obtain the inverse z – transform of $\frac{18z^2}{(2z-1)(4z+1)}$.

20) Obtain the inverse z – transform of $\frac{3z^2+z}{(5z-1)(5z+2)}$.

21) Obtain the inverse z – transform of $\frac{8z-z^3}{(4-z)^3}$.

22) Obtain the inverse z – transform of $\frac{z^3-20z}{(z-3)^2(z-4)}$.

23) Obtain the inverse z – transform of $\frac{z}{(z-2)(z-3)}$

24) Obtain the inverse z – transform of $\frac{5z^2-2z}{(z-1)^4}$.

25) Obtain the inverse z – transform of $\frac{z}{z^2+11z+24}$.

26) Solve the difference equation $y_{n+1} + \frac{1}{4}y_n = \frac{1}{4}^n$ $with\ y_0 = 0$ by using Z-transform.

27) Using z – transform, solve $y_{n+2} - 4y_n = 0$, given that $y_0 = 0$, $y_1 = 2$.

28) Solve the difference equation $y_{n+2} + 6y_{n+1} + 9y_n = 2^n\ with\ y_0 = y_1 = 0$ by using Z-transform.

29) Solve the difference equation $y_{n+2} + 2y_{n+1} + y_n = n\ with\ y_0 = y_1 = 0$ by using Z-transform.

30) Solve the difference equation $u_{n+2} - 3u_{n+1} + 2u_n = 0$ where $u_0 = 0\ and$
$u_1 = -1$ for u_n.

31) Solve the difference equation $y_{n+2} + 4y_{n+1} + 3y_n = 3^n \ with \ y_0 = 0\,,\ \ y_1 = 1$ by using Z-transform.

32) Solve the difference equation $y_{n+2} - 4y_n = n - 1 \ \ with \ y_0 = 1 \ \&\ 0\,,\ \ y_1 = 0$ by using Z-transform.

33) Solve the difference equation $u_{n+2} - u_n = n - 1$ where $u_0 = 1 \ and \ \ u_1 = 2 \ for \ \ u_n$.

34) Obtain the inverse z – transform of $\frac{z^2 - 20z}{(z-2)(z-3)(z-4)}$.

35)Find the inverse Z-transform of $\log(\frac{z}{z+1})$.

36)Obtain the inverse z – transform of $\frac{z}{2z^2+z-10}$.

37) Obtain the inverse z – transform of $(\frac{z}{z-2})^2$.

MODULE - 4 : Ordinary Differential Equations of Higher Order

1. Solve $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$
2. Solve $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 0$
3. Solve $\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 16y = 0$
4. Solve $\frac{d^2y}{dx^2} + w^2y = 0$
5. Solve $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 13y = 0$
6. Find the P.I of $(D^2 + 5D + 6)y = e^x$
7. Find the P.I of $(D^3 + 1)y = \cos(2x - 1)$
8. Find the P.I of $\frac{d^3y}{dx^3} + 4\frac{dy}{dx} = \sin 2x$
9. Find the P.I of $\frac{d^2y}{dx^2} + \frac{dy}{dx} = x^2 + 2x + 4$
10. Solve: $6\frac{d^2y}{dx^2} + 17\frac{dy}{dx} + 12y = e^{-x}$
11. Solve: $(D^3 - D^2 + 4D - 4)y = \sinh(2x + 3)$
12. Solve: $y'' + 2y' + y = 2x + x^2$

13. Solve: $(D^3+8)y=x^4+2x+1$

14. Solve: $\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=x^3$

15. Solve $\frac{d^2y}{dx^2}$ - 5 $\frac{dy}{dx}+6y=e^{5x}$

16. Solve $\frac{d^2y}{dx^2}$ - 3 $\frac{dy}{dx}+2y=10e^{3x}$

17. Solve $\frac{d^2y}{dx^2}$ - 4 $\frac{dy}{dx}+4y=e^{2x}$

18. Solve $(D^3+D^2$-D-1) y = cos $2x$

19. Solve $(D^2+D^1$+ 1) y = sin $2x$

20. Solve $(D^2+5D^1$+ 6) y = cos $x+\ e^{-2x}$

21. Solve $\frac{d^2y}{dx^2}$ + 2 $\frac{dy}{dx}+y=2x+\ x^2$

22. Solve $x^2\,\frac{d^2y}{dx^2}$ – 2x $\frac{dy}{dx}-4y=x^4$

23. Solve $x^2\,\frac{d^2y}{dx^2}$ – 3x $\frac{dy}{dx}+4y=(x+1)^2$

24. Solve $x^2\,\frac{d^2y}{dx^2}$ + 2x $\frac{dy}{dx}-12y=x^2\log x$

MODULE 5: CURVE FITTING

1. Fit a straight-line $y=ax+b$ to the following data

x:	**5**	**10**	**15**	**20**	**25**
y:	**16**	**19**	**23**	**30**	**26**

2. By the method of least squares, find the straight line that best fits the following data:

x	1	2	3	4	5
y	14	27	40	55	68

3. Fit a straight line to the following data:

Year x	1961	1971	1981	1991	2001
Production y	8	10	12	10	16

and find the expected production in 2006.

4. Fit a straight line $y=a+bx$ to the following data:

x:	0	1	2	3	4
y:	1	1.8	3.3	4.5	6.3

5. If p is the pull required to lift a load by means of pulley block. Find a linear block of the form $p = aW + b$ Connected p &w using following data:

w:	50	70	100	120
p:	12	15	21	25

Compute p when W=150.

6. A simply supported beam carries a concentrated load P (lb) at its mid-point. Corresponding to various values of P the maximum deflection Y is measured. The data are given below:

P	100	120	140	160	180	200
Y	0.45	0.55	0.6	0.7	0.8	0.85

Find a law of the form $Y = a + bP$.

7. The results of measurement of electric resistance R of a copper bar at various temperatures t^0 c are listed below:

t	19	25	30	36	40	45	50
R	76	77	79	80	82	83	85

If $R = a + bt$, find a & b.

8. Fit a parabola $y = a + bx + cx^2$ for the following data:

x	1	2	3	4
y	1.7	1.8	2.3	3.2

9. Fit a II degree parabola y= $ax^2 + bx + c$ to the least square method & find y when x=6.

x:	1	2	3	4	5
y:	10	12	13	16	19

10. The revolution r and the time t are related by $r = at^2 + bt + c$, Estimate the number of revolutions for time 3.5 units. Given that,

Revolution	5	10	15	20	25	30	35
time	1.2	1.6	1.9	2.1	2.4	2.6	3

11. Find the parabola of the form y= $ax^2 + bx + c$ which fits most closely with the observations:

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

12. The following table gives the results of the measurements of train resistances; V is the velocity in miles per hour, R is the resistance in pounds per ton:

V	20	40	60	80	100	120
R	5.5	9.1	14.9	22.8	33.3	46

If R is related to V by the relation $R = a + bV + c\,V^2, find\ a\ \&\ b.$

13. The velocity V of a liquid is known to vary with temperature according to a quadratic law $V = a + bT + cT^2$. Find the best possible values of $a, b\ and\ c$ for the following table:

T	1	2	3	4	5	6	7
V	2.31	2.01	3.8	1.66	1.55	1.47	1.41

14. Fit a curve $y = ax^b$ for the following data:

x	1	5	7	9	12
y	10	15	12	15	21

15. Fit a curve of the curve $y = ax^b$ for the data:

x	1	1.5	2	2.5
y	2.5	5.61	10.0	15.6

16. Obtain the correlation of the following data:

x	10	14	18	22	26	30
y	18	12	24	6	30	36

17. Calculate the Karl – Pearson co – efficient for the following ages of husband and wife' s.

Roll No.	1	2	3	4	5	6	7	8	9	10
Husband's age (x)	36	23	27	28	28	29	30	31	33	35
Wife's age (y)	29	18	20	22	27	21	29	27	29	28

18. Calculate Karl-Pearson co-efficient of correlation b/w the marks obtained by 8 students in mathematics and statistics:

Statistics	8	10	15	17	20	23	24	25
Mathematics	25	30	32	35	37	40	42	45

19. Compute the coefficient of correlation & the equation of the lines of regression for the following data.

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

20. Obtain the lines of regression and hence find the co-efficient of correlation for the following data:

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

21. Compute the coefficient of correlation & the equation of the lines of regression for the following data:

x	10	14	18	22	26	30
y	18	12	24	6	30	36

22. If θ is the acute angle between the lines of regression, then show that $\tan\theta = \frac{\sigma_x \sigma_y}{\sigma_x^2+\sigma_y^2}\left(\frac{1-r^2}{r}\right)$. Explain the significance when r = 0 & r = ± 1.
23. In a partially destroyed record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate $\overline{x}$, $\overline{y}$ and the coefficient of correlation between x and y.
24. In a partially destroyed laboratory data, only the regression lines with equations $3x + 2y = 26$ and $6x + y = 31$ are available. Calculate the means of $x's$, means of $y's$ and the correlation co-efficient.
25. Ten competitors in a beauty contest are ranked by two judges in the following order. Compute the coefficient of correlation

I	1	6	5	3	10	2	4	9	7	8
II	6	4	9	8	1	2	3	10	5	7

26. Compute their rank correlation coefficient.

Marks in x	78	36	98	25	75	82	90	62	65	39
Marks in y	84	51	91	60	68	62	86	58	53	47

27. Ten competitors in music contest are ranked by 3 judges A, B, C in the following order. Use the rank correlation coefficient to decide which pair of judges have the nearest approach to common taste of music

A	1	6	5	10	3	2	4	9	7	8
B	3	5	8	4	7	10	2	1	6	9
C	6	4	9	8	1	2	3	10	5	7

28. Compute the standard error of estimate S_x for the respective heights of the following 12 couples:

Height x of husband	68	66	68	65	69	66	68	65	71	67	68	70
Height y of wife	65	63	67	64	68	62	70	66	68	67	69	61