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DPP-6 Maths - IV Unit - 3

Topic - Curve Fitting

Q- By the method of least squares, find straight line that best fits the following data -

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

Equation of line

$$y = a + bx \quad - (1)$$

Normal equations

$$\Sigma y = na + b\Sigma x \quad - (2)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad - (3)$$

$$n = 5$$

x	y	xy	x^2
1	14	14	1
2	27	54	4
3	40	120	9
4	55	220	16
5	68	340	25
$\Sigma x = 15$	$\Sigma y = 204$	$\Sigma xy = 748$	$\Sigma x^2 = 55$

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Put Σx, Σy and n in eq (2)

$$204 = 5a + 15b \quad -(4)$$

Now Put Σxy, Σx, and Σx^2 in eq (3)

$$748 = 15a + 55b \quad -(5)$$

Solving eq (4) and (5)

$$612 = 15a + 45b$$
$$748 = 15a + 55b$$
$$-136 = -10b$$
$$\boxed{b = 13.6}$$

Put value of b in eq (4)

$$204 = 5a + 15 \times 13.6$$
$$5a = 204 - 204$$
$$\boxed{a = 0}$$

Required eq $\Rightarrow y = a + bx$

$$\boxed{y = 13.6x}$$

Ans

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Q-2:- Using the method of least square, fit a straight line to following data:-

x	1	2	3	4	5
y	2	4	6	8	10

Sol:- Equation of line $\Rightarrow$ $y = a + bx$ — (1)

Normal equations $\Rightarrow$

$$\Sigma y = na + b\Sigma x \quad -(2)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad -(3)$$

$n = 5$

x	y	xy	x^2
1	2	2	1
2	4	8	4
3	6	18	9
4	8	32	16
5	10	50	25
$\Sigma x = 15$	$\Sigma y = 30$	$\Sigma xy = 110$	$\Sigma x^2 = 55$

Put Σx, Σy and n in eq (2).

$$30 = 5a + 15b \quad -(4)$$

Put Σxy, Σx^2 and Σx in eq (3).

$$110 = 15a + 55b \quad -(5)$$

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Solving eq ④ and ⑤

$90 = 15a + 45b$

$110 = 15a + 55b$

$-20 = -10b$

$\boxed{b = 2}$

$30 = 5a + 30$

$\boxed{a = 0}$

Required eq of line $\Rightarrow$ $y = a + bx$

$\boxed{y = 2x}$ Ans

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