Page No. ☐☐☐

IML Assignment - 1

Date : ☐☐ ☐☐ ☐☐☐☐

11T2019135
Kathuri Abhinav

(1)

Y	X	X^2	XY
100.2	2006	4024036	201001.2
98.3	2008	4032064	197386.4
87.1	2009	4036081	174983.9
89.2	2011	4044121	179381.2
88.9	2013	4052169	178955.7
83.5	2014	4056196	168169
89.1	2015	4060225	179536.5
84	2016	4064256	169344
92.3	2017	4068289	186169.1
96	2018	4072324	193728
97	2019	4076361	195843
1005.6	22146	44586122	2024498

The hypothesis $Y = h_w(x) = w_0 + w_1 x$

$$w_0 = \frac{(B \cdot C) - (A \cdot D)}{(m \cdot C) - (A \cdot A)}$$

$$w_1 = \frac{(A \cdot B) - (m \cdot D)}{(A \cdot A) - (m \cdot C)}$$

$A = \sum x_i = 22146$

$B = \sum y_i = 1005.6$

$C = \sum x_i^2 = 44586122$

$D = \sum x_i y_i = 2024498$

$$\boxed{w_0} = \frac{(1005.6 \times 44586122) - (22146 \times 2024498)}{(44586122 \times 11) - (22146 \times 22146)}$$

$$= \frac{1271575.2}{2026} = \boxed{627}$$

$$\boxed{w_1} = \frac{(1005.6 \times 22146) - (2024498 \times 11)}{(22146 \times 22146) - (44586122 \times 11)}$$

$$= \frac{539.6}{-2020} = -0.2633$$

$$\boxed{Y = 627 - (0.2633)X}$$

(b) The expected revenue in 2021

$$Y = 627 - (0.2633)(2021)$$

$$= 94.87$$

(c) $m = 11$

$$J = \frac{1}{2(11)} \sum_{i=1}^{11} \left| (h_w(x_i) - y_i) \right|^2$$

$$= \frac{1}{2(11)} \left| (w_0 + w_1 X) - X \right|^2$$

$$= \frac{1}{22}\Big[(92.8-100.2)^2 + (92.26-98.3)^2 + (92.00-87.)^2$$

$$+ (91.47-89.2)^2 + (90.93-88.9)^2 + (90.67-835)^2$$

$$+ (90.40-89.1)^2 + (90.13-84)^2 + (92.3-89.9)^2$$

$$+ (89.6-96)^2 + (89.34-97)^2 \Big]$$

$$J = \frac{1}{22}\Big(54.72 + 36.36 + 24.04 + 5.15 + 4.15$$

$$+ 51.63 + 58.67 + 1.7 + 37.68 +$$

$$5.89 + 40.87 \Big]$$

$$J = \frac{1}{22}(320)$$

$$\therefore J = 14.54$$