→ **Time Series Analysis:—**

1) Consider sales data of an organization for 10 years. use 3-year moving average to predict the sales for the year 2019

Year	Sales
2009	213
2010	221
2011	198
2012	234
2013	201
2014	197
2015	212
2016	222
2017	217
2018	219
2019	?

Compute the error in prediction.
Compute MAD, RMSE and MAPE

A)

Year	Sales	Forecast as per 3 years MA (Y-cap)	Error (Y-Y-cap)	Absolute Error	Squared Error	%: Error
2009	213					
2010	221					$\frac{23.33}{234}=$
2011	198	210.67	23.33	23.33	544.2889	9.9701
2012	234	210.67	16.67	16.67	277.8889	8.2935
2013	201	217.67	-14	14	196	7.1066
2014	197	211	1.33	1.33	1.7689	0.6174
2015	212	210.67	18.67	18.67	348.5689	8.4099
2016	222	203.33	6.67	6.67	44.4889	3.0737
2017	217	210.33	2	2	4	0.9152
2018	219	217	2	2	4	
2019		219.33				

Bias = 21.33

MAD = $\frac{21.33}{11.81}$ = 11.81

RMSE = 14.2278

MAPE = 5.4849

$$\text{Tracking Signal} = \frac{\text{Bias}}{\text{MAD}} = 1.8061$$

Note:- Tracking signal > 6 & < -6, prediction no longer valid. prediction based on previous Prediction Valid.

2) Vaccum cleaner sales for 12 months are given here.

month	Actual sales (in units)
1	10
2	12
3	13
4	16
5	19
6	23
7	26
8	30
9	28
10	18
11	16
12	14

The owner of supermarket decides to forecast sales by weighting the past 3 months as follows

weights Applied	month
3	Pervious month
2	Two months back
1	Three months back

Compute weighted moving average and predict the sales for 13th month.

A)

month	Actual sales (in units)	3-months weighted moving average forecast
1	10	
2	12	
3	13	
4	16	$(13×3+12×2+10×1)/6 = 12.1667$
5	19	14.3333
6	23	17
7	26	20.5
8	30	23.8333
9	28	27.5
10	18	28.3333
11	16	23.333
12	14	18.6667
13		15.3333 ✓