ANSWER 1

```
In [41]: print(results_ARIMA.summary())
```

ARIMA Model Results

Dep. Variable:	D.CO2	No. Observations:	215
Model:	ARIMA(2, 1, 3)	Log Likelihood	1086.555
Method:	css-mle	S.D. of innovations	0.002
Date:	Thu, 24 Oct 2019	AIC	-2159.110
Time:	10:46:15	BIC	-2135.516
Sample:	02-01-2000 - 12-01-2017	HQIC	-2149.577

	coef	std err	z	P>|z|	[0.025	0.975]
const	0.0005	4.52e-05	10.154	0.000	0.000	0.001
ar.L1.D.CO2	1.6971	0.016	104.826	0.000	1.665	1.729
ar.L2.D.CO2	-0.9657	0.016	-61.034	0.000	-0.997	-0.935
ma.L1.D.CO2	-1.4739	0.057	-25.936	0.000	-1.585	-1.363
ma.L2.D.CO2	0.2420	0.102	2.368	0.019	0.042	0.442
ma.L3.D.CO2	0.3486	0.054	6.401	0.000	0.242	0.455

Roots

	Real	Imaginary	Modulus	Frequency
AR.1	0.8787	-0.5133j	1.0176	-0.0841
AR.2	0.8787	+0.5133j	1.0176	0.0841
MA.1	0.9906	-0.3016j	1.0355	-0.0470
MA.2	0.9906	+0.3016j	1.0355	0.0470
MA.3	-2.6755	-0.0000j	2.6755	-0.5000

$$\Delta Y_t = \phi_2 Y_{t-2} + \phi_1 Y_{t-1} + \theta_3 \epsilon_{t-3} + \theta_2 \epsilon_{t-2} + \theta_1 \epsilon_{t-1} + \epsilon_t$$

Thus, the above table represents our summary statistics which gives us the parameter estimates of the above regression equation as below :

ϕ_2 = -0.9657

ϕ_1 = 1.6971

Θ_3 = 0.3486

Θ_2 = 0.2420

Θ_1 = -1.4739

All the coefficients are statistically significant as shown by the low p-values. Thus, ARIMA (2,1,3) model is the best fit.