PV-SRIRAM
1801CS37

Q1) $Y = a + b^* X + \varepsilon$

$a = 10$
$b = 1.5$

$\bar{x} = 10$

assumed normal $(0, \sigma^2)$

$E(Y) = E(a) + E(bX) + E(\varepsilon)$

$\Rightarrow \bar{Y} = a + bE(X) + 0 \Rightarrow \bar{y} = a + b\bar{x} = 10 + 1.5(10)$

$= \boxed{25}$

Q2) The three required conditions are

(i) Constant mean

(ii) Finite and time independent variance

(iii) Constant Auto - Covariance and also time independent (No seasonality)

Q3) Given,

$Y_{t+1} = C - aY_t$

Y_t consists of 2 parts PI, CF (from the difference eqn)

PI

$E(Y_{t+1}) = E(C) - E(aY_t) \Rightarrow \bar{Y}_t = C - a\bar{Y}_t$

(Assuming $t >> 0, t \to \infty$, $\Rightarrow \bar{Y}_{t+1} \approx \bar{Y}_t$)

$\Rightarrow \bar{Y}_t(1+a) = C \Rightarrow \bar{Y}_t = \dfrac{C}{a+1} = PI$

CE

$Y_t = Ab^t$

$\Rightarrow \quad Ab^{t+1} = C - a \times Ab^t$

$\Rightarrow Ab^t[b+a] = C \Rightarrow$ Can only be true if $C=0$,

$\underline{\underline{b = -a}}$

And for convergence, $|b| < 1$

$\Rightarrow \boxed{|a| < 1}$

$\therefore \quad Y_{\cancel{t}}$

Q4) Given,

$TSS = 100$,

$R^2 = 0.91$

we know that $1 = \underbrace{\frac{ESS}{TSS}}_{R^2} + \frac{RSS}{TSS} = \quad 1 = 0.91 + \frac{RSS}{100}$

$\Rightarrow 0.09 \times 100 = RSS$

$\boxed{RSS = 9}$

Q5) $Y_t = 2 + 0.5 \times Y_{t-1} + \varepsilon_t$

~~Xe~~ $a_i^s = \cancel{\text{co}}$ ACF

$s = 1$

$a_1 = 0.5 \quad \Rightarrow \quad a_1^s = 0.5$

6) $Y = X^2 + 10$, $Corr(\cancel{x}, y) = \frac{Cov(X, Y)}{std(X) \cdot std(Y)} = \frac{E((XY) - E(X)E(Y))}{[E(X^2) - E(X)^2][E(Y^2) - E(Y)^2]}$

$E(X) = \bar{X}$

$\Rightarrow E(Y) = \frac{\bar{X}^3}{3} + 10\bar{x}$ $\Rightarrow$ $\frac{(x^3 + 10x) - (x)(\frac{x^3}{3} + 10x)}{[\frac{x^3}{3} - x^2][x^3 + 10x]} \simeq -2$

7) If a sample size is ~~no~~ greater than or equal to 20 and at a level of significance of 5% then an absolute value of 2 ($|t| >= 2$) is enough to reject NULL hypothesis

8) $RMSE = \sqrt{\frac{\sum_{i=1}^{n} (y_i - \bar{y})^2}{n}}$

9) $Var(X + 2Y) = Var(X) + Var(2Y) + \cancel{2Cov(X, 2Y)}^{0}$

(Independence)

$Var(X) = 10$

$Var(2Y) = 4 \times Var(Y) = 4 \times 5 = 20$

$\Rightarrow 10 + 20 = \boxed{30}$

10) Kurtosis is the standardized 4^{th} central moment, and it measures how spread out a distⁿ is.

$Kurt = \frac{E((X - \mu)^4)}{\sigma^4}$