Somehow I ~~discored~~ discovered that we have to submit the justifications only after solving the Quizz. Thus answers given here and in the quizz may differ.

1. stationary

$\{W_t\}$ is modeled as a MA(3)

$\Rightarrow \{W_t\}$ is stationary

invertible

The characteristic polynome $\Theta(B) = 1 + 0.9B - 0.7B^2 + 0.8B^3$

~~equation~~ has ~~solution~~ roots: $B_1 = -0.8221\ldots$

$B_2 = 0.84\ldots - 0.89\ldots i$

$B_3 = \ldots$

since $|B_1| \leq 1$, not all roots are greater than 1

$\Rightarrow \{W_t\}$ in not invertible

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2. ~~Only finitely many~~

Forgot to take a screenshoot

3. Only finitely many autocorrelations bigger than 0 $\Rightarrow$ MA model

Is it B or D?

B: $\rho(1) = \frac{-\theta}{1+\theta^2} = \frac{0.4}{1+0.4^2} > 1$

D: $\rho(1) = \frac{-0.4}{1+0.4^2} < 1$

$\Rightarrow$ B

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4. AR model $\Rightarrow$ invertible

$\phi(B) = 1 - 0.3B + 0.1B^2 - 0.8B^3$ has root

$B = 1$

$\Rightarrow$ stationary solution does not exist

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5. $\rho(3) > 0$ $\Rightarrow$ can not be a MA(1) model.

$\Rightarrow$ Solution is either ~~B or D~~ A or C.

A: $\rho_1 = -0,4$ $\rho_2 = -0,4^2 = 0,16$ $\rho_3 = -0,4^3 = -0,064$

C: $\rho_1 = 0,4$ $\rho_2 = 0,16$ $\rho_3 = 0,064$

Since in the plot ρ_1 and ρ_2 are above 0 it must be C.

6. Can not be MA(2) model since $\rho_3 > 0$

$\Rightarrow$ either B or C

B: $\rho_1 = \frac{-0.1}{1+0.5} = -0.0\bar{6}$

$\rho_2 = -0.5 - \frac{0.01}{1.5} = -0.506\bar{6}$

$\rho_3 = -0.1 \cdot (-0.506\bar{6}) + (-0.5)(-0.0\bar{6}) = 0.084$

A: $\rho_1 = \frac{0.1}{1-0.5} = 0.2$

$\rho_2 = 0.5 - \frac{0.1^2}{1-0.5} = 0.5 - 0.02 = 0.48$

$\rho_3 = 0.1 \cdot 0.48 + 0.5 \cdot 0.2 = 0.048 + 0.1 = 0.148$

Since in the plot no negative numbers occur, it must be A.

7. This sequence is modeled as an AR(3) and is thus invertible.

$\phi(B) = 1 - 0.4B + 0.9B^2 + 0.2B^3$ is the characteristic polynom.

It has a root of $0.936\ldots =: B_3$.

Since $|B_3| \leq 1$ the process is not stationary

8. I forgot to take a screenshot

9. Autoregressive model ⇒ invertible

$\phi(B) = 1 + 0.1B - 0.7B^2 + 0.8B^3$

ϕ has a root of $B_1 = 0.8466 + 0.8946i$

$|B_1| \leq 1 \Rightarrow$ not stationary

10. Autoregressive model ⇒ invertible

$\phi_1 = -0.5 \quad \phi_2 = 0.5$

conditions for stationarity

i) $|\phi_2| < 1$ ✓

ii) $\phi_1 + \phi_2 = 0 < 1$ ✓

iii) $\phi_2 - \phi_1 = 0.5 - (-0.5) \not< 1$ ✗

The third stationarity condition is not satisfied

⇒ non stationary