Summer School – Practice Multiple-Choice Questions

1. What is the main purpose of applying a threshold to a residual signal?

- To estimate the system input
- To decide whether a fault may be present
- To eliminate the system dynamics
- To calculate the model parameters

2. Which situation is most likely to produce a false alarm in a model-based fault detection system?

- A perfectly accurate mathematical model
- The absence of measurement noise
- Significant modelling errors or disturbances
- A residual that remains close to zero

3. What is the main objective of fault isolation?

- To determine whether the system is stable
- To identify the location or type of the detected fault
- To eliminate all measurement noise
- To calculate the nominal system output

4. In Recursive Least Squares identification, what is generally achieved by selecting a forgetting factor close to one?

- Greater emphasis on the most recent measurement only
- Smoother parameter estimates and a longer data memory
- Complete removal of measurement noise
- Automatic reduction of the model order

5. What is the principal role of a validation dataset in neural network modelling?

- To update the network weights continuously
- To generate physical redundancy
- To evaluate the network performance on data not used for training
- To determine the number of system sensors

6. In fuzzy logic, what does a membership value of 0.7 indicate?

- The element certainly does not belong to the fuzzy set
- The element belongs to the fuzzy set with degree 0.7
- The element belongs simultaneously to seven fuzzy sets
- The fuzzy set contains exactly 70 elements

7. What is a common effect of a constant bias fault affecting a sensor?

- A constant offset in the measured signal
- A complete loss of system dynamics
- A reduction in the number of system states
- A random variation in the control input

8. Why are on-line identification methods useful for systems with time-varying parameters?

- They eliminate the need for input measurements
- They update parameter estimates as new data become available
- They always produce an exact nonlinear model
- They require no initial parameter values

9. In a feedforward neural network, how does information normally propagate?

- From the output layer back to the input layer only
- Through closed feedback loops between all neurons
- From the input layer towards the output layer
- Randomly between the hidden neurons

10. What is the main function of an observer in a model-based diagnostic system?

- To replace every physical sensor
- To estimate system variables using the model and available measurements
- To increase the amplitude of measurement noise
- To generate faults for testing purposes