UNIT - II

Model development:

We can make initial classification by asking whether the model describes the structure (or) the behaviour of a system.

In classical modelling the model establishes only, components make up the system and how these are connected together.

In structural modelling, take in the description of the structure of an equation s/m on finite state machine. model description can be called structural i.e, electronic circuit diagram, state graphs, block diagrams etc., common is that all these forms are in graphical in nature.

In behavioural model, the system description is achieved on basis of underlying physics (or) measured input / output behaviour.

As an alternative to modelling on the basis of physical behaviour the other option is to take measured data and feed this into models, called as experimental modelling. & is used if physical modelling is not implementable (or) the resulting model is too complex for desired purpose.

In both physical & experimental modelling the model are generally formulated on basis of equations & assignments.

* Structural modelling

A structural model is characterized by the basic model used and the connection structure between these basic models.

A module can be composed of basic models and can itself be again connected to other modules.

A structural model can be characterized on the basis of following terms.

* Hierarchy
* Modularity
* Regularity
* Locality

Hierarchy of a model is derived from the call structure of basic models & modules, can be described as a tree.

The Modularity of the system related to the question to how simple & reasonable it is to divide the system into modules.

Regularity is a measure of how many module types are necessary to represent the entire system. low number is more beneficial as it indicates a compact representation.

Locality is a measure of how well a

⇒ circuit diagram:

In the case of design using a circuit diagram editor, modelling is primarily used for the derivation of a net list, which is used as a circuit model, incorporating the component or gate models.

The field of application is predominantly the development of analogue circuits. Although digital circuits can also be developed using circuits diagram.

⇒ State graphs.

Digital systems can also be represented by state graphs with the system structure then being stored on relatively abstract levels. only the structure of the connections is necessary in order to characterise the model

⇒ Multibody diagram.

Things are more complicated for multibody mechanics. eg., when drawing up the model equations it is often the system as a whole that is considered rather than viewing it as collection of components

→ Finite elements :

A particularly graphic form of Structure modelling is to break down mechanical Structure into finite elements for the modelling of continuum mechanics. This is also called meshing. both geometric dimensions and topological information are important.

Meshing has to checked ⇒ elements have correct form etc.,

* physical modelling :

In physical modelling, it describes the behaviour & inner action mechanism of the system (or) a component.

⇒ perspectives of modelling :

offers a course division of physical models which runs through all the disciplin. we should differentiate whether the system perspective (or) component perspective has been Selected.

→ System oriented modelling formulates the system in overall context.

→ object oriented modelling formulates components which form a s/m only by connectio

⇒ Resulting equations.

This investigates the equations that result from the various modelling forms.

The number of equations depends upon the circuit and is very high, typically significantly above the number of degrees of freedom.

* Experimental modelling:

Experimental modelling consists of the development of mathematical model of dynamic system on the basis of measured data (or) at least providing existing models with parameter.

⇒ Table model

The simplest method of incorporating measured data is by the formulation of table models that lead to a stepped (or) piece-wise linear characteristic.

⇒ parameter estimation & system identification.

= parameter estimation → requires model + considers the parameters that belong to it.

- Some parameters, such as mass (or) spring constants are generally accessible without parameter estimation.

– In system identification, a model for the s/m is created on this basis or selected from a group of candidates. This is generally efficient and numerically unproblematic.

(1) Signal analysis
↳ (2) Specification of the modelling method → (3) Selection of a quality criterion
↓
(4) Calculation of the parameters.

(system identification sequence)