Assignment no. 1 M&S

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assignment Q No 1.

When is simulation appropriate tool and when not?

Ans = Simulation is an appropriate tool when:

i) it enables one to study internal interactions of a complex system or of a subsystem with in a complex system.

ii) it can be used to verify analytical solutions

iii) the effect of information, organization and environmental changes on the model's behaviour can be simulated and observed.

iv) simulation can be used to experiment with new designs or policies so as to estimate its effect

v) using animation we can visualize the system in a particular stage of operation.

vi) the interactions in modern complex system like factory, water fabrication, etc can be treated only through simulation.

vii) simulation models designed for training allow learning without any cost

Simulation is not appropriate tool when:

i) if system behaviour is too complex or cannot be defined

ii) problem is solvable by common sense

iii) problem can be solved mathematically

iv) if it is easier to perform the experiment directly.

v) simulation costs exceed the savings.

vi) simulation cannot be verified or validated.

vii) No i/p data available and simulation needs data.

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assignment Question #2

What are Monte-Carlo simulation methods and when were they formed?

⇒ The Monte Carlo simulation methods were invented by John Von Neumann and Stanislaw Ulam during World war II to improve decision making under uncertain conditions. It was named after a well-known casino town, called Monaco because chance and random outcomes are central to this modeling techniques similiar to games of roulette. Monte Carlo methods maybe thought of as a collection of computational techniques for the (usually approximate) solution of mathematical problems, which make fundamental use of random samples. It is a model used to predict the probability of a variety of outcomes when the potential for random variables is present. This simulation requires assigning multiple values to an uncertain variable to achieve multiple results and then averaging the results to obtain an estimate.

Monte-Carlo simulations are also utilized for long-term predictions due to their accuracy. As the number of inputs increase, the number of forecasts also grows, allowing you to project outcomes farther out in time with more accuracy. When a Monte Carlo simulation is complete, it yields a range of possible outcomes with the probability of each result occuring.

One simple Example of a Monte Carlo simulation is to consider calculating the probability of

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rolling two standard dice. There are 36 combination of dice rolls. Based on this, you can manually compute the probability of a particular outcome. Using a Monte Carlo simulation, you can simulate rolling the dice 10,000 times (or even more) to achieve more accurate/precision predictions.

assignment question 3.

Give any five simulation applications in manufacturing and transporting systems.

=) Applications of simulations in manufacturing and transporting systems:

a) Assembly line balancing
- Discrete Event Simulation
- designing and balancing of assembly lines

The assembly line is a production line where material moves continuously through a series of workstations where assembly work is performed. Line balancing is a flow-oriented production strategy for improving productivity and cost efficiency in mass production processes. An optimal time frame is designated for the production of a particular product. In nutshell, production (assembly line balancing is simply the assignment of right number of workers and machines to each assembly line segment. This helps meet production rate targets with minimal idle time.

- It reduces the amount of idle time in work stations

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- maximizes workforce utilization and production capacity
- reduces wastage

5) Cellular planning

In cellular manufacturing, the placement of production workstations and equipment ensures that materials and components go smoothly through the production process with little movement or delay. Specific analytical methods are used in this one-piece flow method to evaluate present operations and create a new cell based production layout that will shorten cycle times and changeover time.

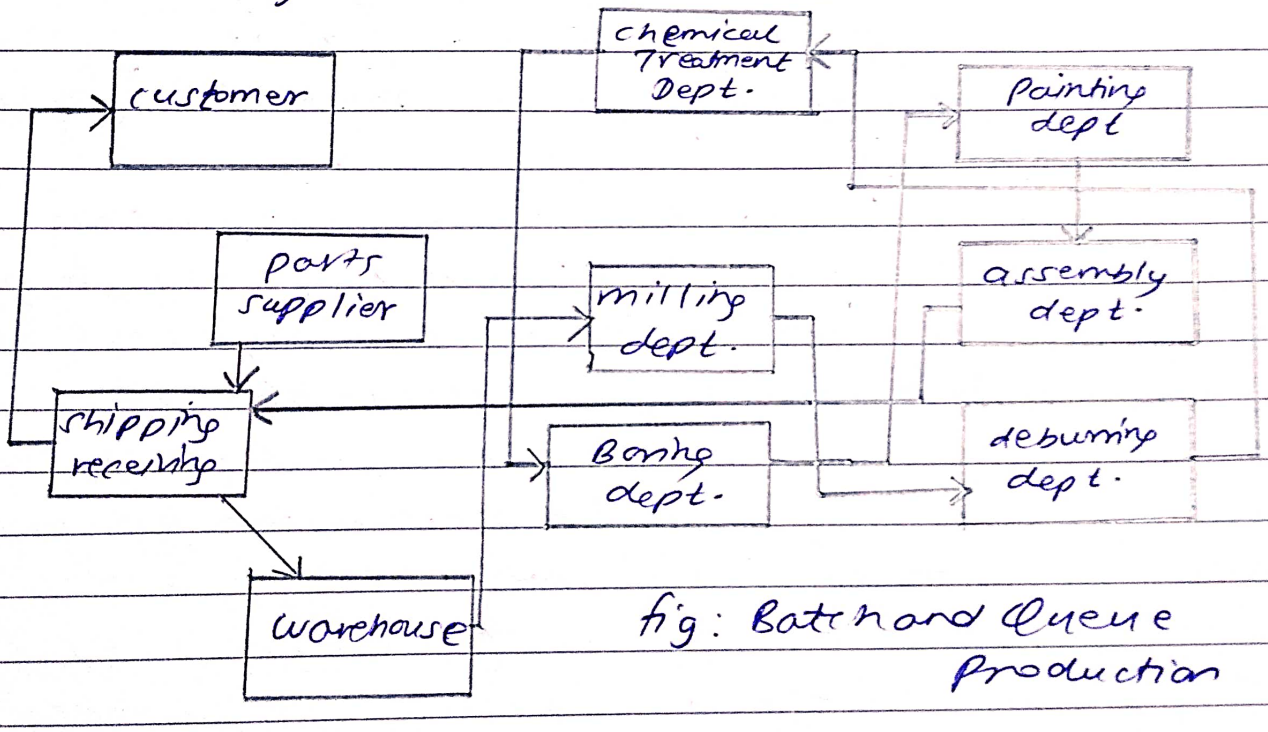

fig: Batch and Queue production

c) Traffic simulation

The mathematical modelling of transportation system (such as freeway junctions, arterial routes, roundabouts, city grid systems, etc.) through the use of computer software is known as traffic simulation or the simulation of transportation systems.

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Simulation methods in transportation can employ a selection of theories, including probability and statistics differential equations and numerical methods.

- Monte Carlo method
- Cellular automata model
- discrete event and continuous-time simulation
- Car-following models: They model the behaviour of each individual vehicle ("microscopic") in order to see its implications on the whole traffic system ("macroscopic").

d) Roadway and ground transportation

Perhaps the most common application of simulation is in ground transportation, which includes both passenger and cargo movement. To study planning, design and operations such as delay, pollution and congestion, simulation can be done at level of a roadway grid network or at the level of a more complicated roadway corridor network. All forms of road travel, including cars, trucks, buses, bicycles and pedestrians; can be modelled for ground transportation. Aggregate representation of traffic is typically used in traditional road traffic models, where all vehicles of particular group adhere to the same rules of behaviour.

e) Inventory management

The process of ordering, storing, using and selling a company's inventory is referred to as inventory management. This covers the storage and processing of such commodities as well as the management of raw materials, components and completed goods.

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Simulation models enable the management and analysis of inventory and order data in the competitive economic environment of today. In order to create inventory ordering models based on ~~Econ~~ Economic order quantity and safety stock principles, inventors management solutions must assess previous sales. The aim of inventory management is to provide sufficient quantities of goods in the warehouse so that user requirements can be filled at moment. Considering the stochastic nature of demands, it is increasingly difficult to manage inventories. Depending on the time of delivery, ordering costs of holding, and lack of inventories this objective can be achieved by applying some of the inventory management strategies.

assignment question 4. Name several entity, attributes, activities, events and state variables of a typical automatic teller machine (ATM).

→ Automatic teller machine (ATM):

- Entity = ATM card, ATM machine, CC camera, security guard, people,
- Attributes = fast, accurate, secure, empty, full, informative,
- Attributes of customers = in hurry, careful, skeptic, excited
- activities = arrival of people, departure of people, withdraw of cash, counting of cash, insertion of atm card, entering details

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deposition of cash, etc.

- events = arrival of new person, inadequate cash, faulty machine, atm card stuck