Internal Assessment Test 3 – June 2022

Sub:	PLCM					Sub Code:	17ME835	Branch:	ME		
Date:	17.06.2022	Duration:	90 min's	Max Marks:	50	Sem / Sec:		8th B		OBE	
	Answer any FIVE FULL Questions							MARKS	CO	RBT	

1a.	Discuss the need and benefits of virtual product development?	(10)	CO4	L1

Virtual product development (VPD) is the practice of developing and prototyping products in a completely digital 2D/3D environment. VPD has four main components: virtual product design (3D shape, 2D graphics/copy) virtual product simulation (drop test, crush test,

Virtual product development (VPD) is the practice of developing and prototyping products in a completely digital 2D/3D environment. VPD has four main components:
Virtual product design (3D shape, 2D graphics/copy)
Virtual product simulation (drop test, crush test, etc.)
Virtual product staging (retail space planning, consumer research and behavior analysis) Digital manufacturing (process planning, assembly/filling virtualization, plant design).

VPD typically takes place in a collaborative, web-based environment that brings together designers, customers/consumers, and value chain partners around a single source of real-time product "truth". VPD enables practitioners to arrive at the right idea more quickly, and to accurately predict its performance in manufacturing and retail settings, ultimately minimizing time to value, market failure potential, and product development costs. Virtual process planning is a relatively new concept for manufacturing companies, although the concept has been in use for the construction industry for several years. BIM (building information modeling) is the system used by many constructions, architectural and contracting firms. The detail and scheduling aspects are some of the more valuable aspects of the system. By utilizing virtual process planning, the entire production process can be designed to both maximize efficiency and avoid the trial and error method employed by most manufacturers. Various software exists with differing levels of information. The placement of workstations, inventory, personnel and equipment can be valuable for space planning. The interaction of the previously mentioned can also be investigated, allowing the user to identify potential issues from safety, quality and ergonomic standpoints.

Virtual Product Development, VPD, is a result of constant efforts in a direction to overcome the limitations of conventional testing procedures. VPD allows a designer to take important design decisions at early stages based on test results, giving control over cost. 'Virtual product development' is a strategy for coordinating technology, processes and people to enhance the established product development process. It is a gradual process that efficiently builds up a product virtually. Thus any changes to be made in its design can be reflected into its physical properties, supply chain, distribution channel and ultimately into the customer view; without physically manufacturing the product.

VPD encompasses a wide variety of software tools to cover a product from the conception to the final design and even manufacturing. This path consists of various processes to be carried out at manufacturing level, testing procedures and the final design which is modified automatically based on the test results. One of the major advantages of VPD is its computer brain capability, which can simulate various complex load conditions at a time. Non-linear load conditions are not always possible

	to create at the testing center where the prototypes are being tested in conventional testing methods. These complex conditions, if accommodated in the testing, can yield more reliable product form. It is a new kind of manufacturing technology. It is based on: Simulation technology Virtual reality technology Information technology Virtual product development (VPD) provides engineers with a better understanding of product performance attributes and eliminates design problems. By using virtual prototypes to detect problems or performance issues early in the product development process, problems can be corrected quickly. Accurate Modeling for Robust Simulation of Power Electronic Systems. Streamlining Vehicular Electrical System Design and Verification. Accelerating Software Development with Fast Virtual Prototypes.			
2a.	Explain the use of digital mockup in product development? A mockup is a model of a digital creation. Basically, it's how your digital product would look in the real world (or in a simulation of it). There are two types of mockups. The first is a lifestyle mockup. You use a photo as a background image to place your product in a real-life setting A mockup is a conceptual tool that is used especially in web development. It is basically an early draft of a website or web application. Mockups are primarily used for conception to convert ideas and concepts into a concrete design. As a transitional phase between wireframes and prototypes, mockups help designers by allocating time strictly to visuals. As mid- to high-fidelity representations of the final product, mockups help stakeholders immediately understand the final form of the product. One of the most important elements of designing an object, a building, a landscape (or anything for that matter) is the mock-up. A mock-up is a scaled (often times full scale) model of a design, fabricated out of inexpensive materials and used to evaluate design elements in question Digital Mock Up or DMU is a concept that allows the description of a product, usually in 3D, for its entire life cycle. Digital Mockup is enriched by all the activities that contribute to describing the product. The product design engineers, the manufacturing engineers, and the support engineers work together to create and manage the DMU. One of the objectives is to have an important knowledge of the future or the supported product to replace any physical prototypes with virtual ones, using 3D computer graphics techniques. As an extension it is also frequently referred to as Digital Prototyping or Virtual Prototyping. These two specific definitions refer to the production of a physical prototype, but they are part of the DMU concept.	(10)	CO4	L2
3a.	Explain the benefits of 3D CAD Systems? Explanation of these benefits. Increases Productivity Higher Quality Designs Reuse and Easily Change Designs Easier to Read Simplified Sharing Documenting the Design Skill of the Designer Designing Physical Objects in a Virtual Workspace.	(10)	CO4	L2
4a.	Explain the techniques involved in solid modeling for building 3D Models? Solid Modeling Methods	(10)	CO4	L1

Constructive Solid Geometry (CSG or C-Rep)

- Constructive Solid geometry is one of the two most popular and widely used approaches to create the solid models of the objects.

- In a constructive solid geometry approach, a solid model of an object is created by using the three-dimensional geometric entities, known as primitives.

- These primitives can be combined by a mathematical set of Boolean operations to create the solid.

- In a constructive solid geometry (CSG) approach, two or more primitives are combined by a Boolean operations to create a desired model.

- The Boolean operations are used are: union (∪ or +), intersection (I) and difference (-)

Pure Primitives

- In a primitive instancing approach, all the objects that have the same topology but different geometry are grouped into a family called generic primitive.

- The primitives are defined in terms of a parameter group. For example, a block primitive is defined by parameters: height (H), width(W) and depth(D).

- By inputting the values of parameters defining the primitive, the model can be generated.

- In addition to the basic primitives, the library of generic primitives (shapes) which are commonly used is created.
  The generic primitive can be called from the library by its assigned name and it can be created by inputting the values of parameters

pure primitives

Boundary Representation(B-Rep)

In addition to the CSG approach, the boundary representation (B-rep) is the another popular and widely used approach to create the solid models of the objects.

Any physical object can be considered to be bounded by a set of faces. In a boundary representation (B-rep) approach, a solid model of an object is created by using a set of faces. Each face is bounded by the edges and each edge is bounded by the vertices.

5a	Explain the role of production planning in virtual product development? Production planning and control refers to two strategies that work cohesively throughout the manufacturing process. Production planning involves what to	(10)	CO4	L2

produce, when to produce it, how much to produce, and more. A long-term view of production planning is necessary to fully optimize the production flow.

Production control uses different control techniques to reach optimum performance from the production system to achieve throughput targets.

BENEFITS OF PRODUCTION PLANNING AND CONTROL

The benefits of production planning and control include:

- Improved organization for regular and timely delivery

- Better supplier communication for raw materials procurement

- Reduced investment in inventory

- Reduced production cost by increasing efficiency

- Smooth flow of all production processes

- Reduced waste of resources

- Production cost savings that improve the bottom line

OBJECTIVES OF PRODUCTION PLANNING AND CONTROL

The objectives of production planning and control can vary from one business to another, but some general objectives include the following:

- Regulation of inventory management

- Optimum utilization of production process and resources

- Organization of the production schedules, typically with the help of dynamic production scheduling software

- To make sure the right quality and quantity of equipment, raw materials and more are available during production times

- To ensure capacity utilization is aligned with forecast demand

6a	Explain product data flow in virtual product development. Virtual Product Development (VPD) is an approach that takes a design at the earliest concept stage and fully evaluates design specifications and usage scenarios, and then uses this information to guide the development process. Across industries, VPD enables companies to leverage resources by optimizing product designs leading to improved performance, reduced need for real-world prototypes, verifiable quality improvements, and minimized operational problems and failures.	(10)	CO4	L2

VPD continues to expand in its usefulness and application adding new efficiencies to product development processes. These efficiencies have become a key factor in an organization's success in today's marketplace.		

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