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**ASSIGNMENT 1**

1. What are different types of plastics?
2. Acrylic or Polymethyl Methacrylate (PMMA): Acrylic is a transparent thermoplastic used as a lightweight, non-abrasive material and a great alternative to glass.
3. Polycarbonate (PC): It is tough, stable and transparent. It is an excellent engineering plastic that is as clear as glass and two hundred and fifty times stronger.
4. Polyethylene (PE): There are various densities of polyethylene that is manufactured for eg: Low density, Medium density, High density and Ultra High Molecular Weight polyethylene.
5. Polyvinyl Chloride (PVC): PVC can be manufactured to possess rigid or flexible properties. It is well-known for its ability to blend with other materials.
6. Acrylonitrile-Butadiene-Styrene: It is robust, flexible, glossy, highly processable, and impact resistant.
7. What is DFM? Why do we need to consider DFM during the design phase?
8. Design for Manufacturing, also known as Design for Manufacturability (DFM), is the process of improving the design of a part, product, or component in order to make it cheaper and easier to make.
9. To lower manufacturing costs, DFM entails efficiently designing or engineering an object, usually during the product design stage, when it is easier and less expensive to do so.
10. This enables a manufacturer to detect and prevent errors or inconsistencies. DFM is essential for efficiency, speed, and high production rates.
11. List key DFM considerations for plastic part design.
12. Material Considerations (Temperature, chemical resistance, cost, availability, etc)
13. Radius
14. Wall Thickness
15. Mold Shrinkage
16. What is GD&T and why is it important?
17. Geometric Dimensioning and Tolerancing (GD&T) is a design and manufacturing approach that aids engineers and designers in communicating how to bring a part design to life. It is possible to create a part that exactly fits its on-paper drawings when properly documented with GD&T.
18. It employs a symbolic language to specify how far part features can stray from the design model's geometry.
19. GD&T provides a more accurate representation of the product design to the producer. It enables designers and engineers to be very particular in their manufacturing requirements while also allowing manufacturers to use their knowledge to do things the best manner possible.
20. What are plastic manufacturing technologies? Explain each in brief.
21. 3D Printing: 3D printers produce three-dimensional parts directly from CAD models by layering material until a complete physical part is created. 3D printing procedures are often slower and more labor-intensive than mass-production manufacturing processes.
22. CNC Machining: Mills, lathes, and other computer-controlled subtractive operations are examples of CNC machining. These procedures begin with solid metal or plastic blocks, bars, or rods that are formed by removing material by cutting, boring, drilling, and grinding . CNC machining, unlike most other plastic manufacturing techniques, is a subtractive process in which material is removed using either a spinning tool and a fixed component (milling) or a spinning part and a fixed tool (turning) (lathe).
23. Polymer Casting: A reactive liquid resin or rubber is poured into a mould, which reacts chemically and solidifies. Polyurethane, epoxy, silicone, and acrylic are common casting polymers. Polymer casting is low-cost and requires little initial investment, but thermoset polymers for casting are typically more expensive than their thermoplastic counterparts, and moulding cast parts is time-consuming.
24. Vacuum Forming: Vacuum forming is a manufacturing process in which a plastic is heated and shaped, usually with the help of a mould. From low-cost desktop devices to automated industrial gear, vacuum forming machines come in a variety of sizes and complexity. Due to the low forces and pressures required in vacuum forming, tooling costs are negligible when compared to other moulding procedures.
25. What are different technologies of rapid prototyping?
26. Stereolithography (SLA): Stereolithography is a 3D printing technique that employs a computer-controlled moving laser beam that has been pre-programmed with CAD/CAM software.Stereolithography (SL) is an industrial 3D printing technology that can produce concept models, rapid prototypes, and complicated items with sophisticated geometries in as little as one day.
27. Selective laser sintering (SLS): Engineers and manufacturers in a variety of industries rely on selective laser sintering (SLS) 3D printing to create sturdy, functional items. Selective laser sintering (SLS) is an additive manufacturing (AM) technique that involves sintering microscopic particles of polymer powder into a solid structure based on a 3D model using a high-powered laser.
28. Fused Deposition Modelling (FDM): Fused deposition modelling (FDM) is a popular additive manufacturing technique for modelling, prototyping, and production. Fused Deposition Modelling (FDM) creates three-dimensional things directly from three-dimensional CAD data. Layers of thermoplastic material are extruded by a temperature-controlled head.
29. CNC Machining Prototyping: CNC (Computer Numerical Control) machining is a type of subtractive (rather than additive) manufacturing used to make parts and components out of metals, alloys, and engineered polymers.
30. Can we use the 3D printed parts for functional requirements? Please explain.
31. 3D printing is a versatile method that can be used to make anything from desk toys to functioning parts for sale to clients. It's only natural that the manner you approach printing differs depending on the part's intended application.
32. 3D printing is evolving from an aesthetic, non-functional prototype technique to a technology that can meet real-world needs.
33. In highly competitive industries, a brand's time to market might be the determining element in its success. By bypassing traditional tooling processes and decreasing lead times on prototypes and end-use parts, mass production using 3D printing can drastically reduce time to market.
34. What is ingress protection? What makes the enclosures ingress protective?
35. The level of protection provided by an electrical enclosure against solids and liquids is referred to as ingress protection ratings, or IP ratings.
36. A sealed enclosure is utilised in an area where dust or water could damage electronic components. It prevents such entrance and protects the electronics.
37. What is the difference between design and simulation?
38. Design is the process of coming up with a concept for a function or shape. Design is a rough sketch with a lot of ambiguous elements. Modeling ensures that all of the details are in place, that your design can be manufactured, and that it does what you set out to do.
39. A simulation is the process of studying the behavior and performance of a real or hypothetical system using a model. Models can be used in simulations to investigate existing or projected system characteristics.
40. Write the stepwise procedure for FEA simulation. Assume whatever is necessary.
41. Modelling: Complex geometrical aspects are not included in the model. This is the most important and first stage in any analysis. This will provide you the knowledge you need to remove minor features from your geometry, which will save you time and unnecessary complexity in the long run.
42. Material definition: This stage establishes the material qualities. These material qualities are determined by the type of analysis required.
43. Definition of loads: This stage involves defining the external pressures operating on the part, as well as the body force resulting from the component's weight.
44. Boundary conditions: This step is mainly done to reduce the complexity of the problem from an engineering sense.
45. Meshing: Geometry is broken down into finite elements, which are smaller and simpler shapes.
46. Solution: Matrices of individual elements are assembled into global matrices for the entire geometry which is then solved by solvers for unknown variables.
47. Post-processing: Any FEM software will have some sort of indicator to show the user if the solution was successfully accomplished.