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1. Explain in detail the following tools used in Engineering Economics
2. **Payback Period Analysis** – It is the mathematical methodology to determine the amount of time it takes to recover the cost of an investment.
3. **Future Worth Comparison** – In the future worth method of comparison of alternatives, the future worth of various alternatives will be computed. Then, the alternative with the maximum future worth of net revenue or with the minimum future worth of net cost will be selected as the best alternative for implementation.
4. **Present Worth Comparison** - In present worth method of comparison, the cash flows of each alternative will be reduced to time zero by assuming an interest rate i. Then, depending on the type of decision, the best alternative will be selected by comparing the present worth amounts of the alternatives. In case the decision is to select the alternative with the minimum cost, then the alternative with the least present worth amount will be selected. On the other hand, if the decision is to select the alternative with the maximum profit, then the alternative with the maximum present worth will be selected.
5. **Cash flow diagrams**- Cash flow diagrams are diagrams that visually represent income and expenses over some time interval. The diagram consists of a horizontal line with markers at a series of time intervals. At appropriate times, expenses and costs are shown.
6. Define the following terms and state their significance as applicable in Engineering design

i) **Tolerance**

Tolerance refers to the range that an actual measurement can vary from its intended measurement.

Helps to ensure that the final product is readily usable, especially if it is a part of a larger assembly. Not setting a tolerance in a critical area may render the part unusable according to the design intent, as each fabrication method comes with a certain level of inaccuracy.

ii) **Limits of size**

The maximum and minimum permissible sizes between which the actual size should lie. The larger value for each part is the upper limit, and the smaller value is the lower limit.

iii) **Datum**

A datum is a plane, a straight line, or a point that is used as a n processing a material or measuring the dimensions of a target. They provide points of reference point, surface, or axis on an object against which measurements are made.

1. Define the following terms as used in Engineering Design:
2. **Aesthetics** – Aesthetics is a set of principles concerned with the nature and appreciation of beauty.
3. **Symmetry** - Symmetry, or symmetrical balance, is a concept where both sides of something mirror one another.
4. **Balances** - Balances are simple accounting procedures used to aid in the overall analysis of a process 's viability.
5. **Variety** - variety refers to the degree of which a specific product’s design changes over time, as well as the degree to which the designs of specific products differ.
6. **Proportion** -  proportion in science and engineering  represents relationships between physical quantities
7. **Contrast** - The design principle contrast refers to the use of visually different elements.
8. State 5 contents of a schedule management plan

**Planning schedule management**: determining the policies, procedures, and documentation that will be used for planning, executing, and controlling the project schedule.

**Defining activities**: identifying the specific activities that the project team members and stakeholders must perform to produce the project deliverables.

**Sequencing activities**: identifying and documenting the relationships between project activities.

**Estimating activity resources**: estimating how many resources a project team should use to perform project activities .

**Estimating activity durations**: estimating the number of work periods that are needed to complete individual activities .

1. Describe 3types of fits when considering tolerancing mating parts

i) **Clearance Fit**

Clearance fits allow for loose mating, where free movement is important and a certain amount of play is desired. It is called for where elements should be able to slide in and out without obstruction, and where alignment can be loosely guided but does not require tight precision.

Examples of clearance fit might include bolt/shaft holes where an element will slide freely through another feature.

ii) **Interference Fit**

An interference fit will be much tighter than a clearance fit. Also referred to as a press fit or friction fit, the interference fit requires some degree of force to join two components. Once joined, this creates a relatively solid union that would require substantial force or potential machine operations to uncouple.

Pressing a bushing, bearing, dowel pin or other items into their mating components are all examples of how an interference fit can be used

iii) **Transition Fit**

A transition fit would fall between a clearance and interference fit. Transition fits are called for when accurate alignment is critical, and mating parts must join with greater precision. You may also see these referred to as a slip or push fit. There will still be a greater degree of clearance than a press/interference fit, but it will be substantially smaller and should remove excess play or movement in the joint.