Q) What is time value of money? Explain how compounding and discounting are   
 used in capital investment decisions.

A) The Time Value of Money concept indicates that money earned today will be   
 more than in its intrinsic and basic value in the near future. It is because of the   
 potential earning capacity of the given amount of money. Time Value of   
 Money is also defined as Present Discounted value. Money   
 deposited in a savings bank account earns a certain interest rate to compensate   
 for keeping the money away from them at the current point of time. Therefore,   
 if a bank Account holder deposits $100 in the account, the expectation will be   
 to receive more than $100 after one year.

The concept is about the Present Value and Future Value of money as -.

* **Compounding** method is used to know the future value of present money.
* **Discounting** is a way to compute the present value of future money.

Compounding refers to the process of earning interest on both the principal amount, as well as accrued interest by reinvesting the entire amount to generate more interest.

Compounding is the method used in finding out the future value of the present investment. The future value can be computed by applying the compound interest formula which is as under:

Future Value:

Single Cash Flow =

Annuity = Amount X

Where n = number of years  
R = Rate of return on investment.

**Discounting**

Discounting is the process of translating the future amount into its Present Value. What is the present value? The current value of the given future value is known as Present Value. The discounting technique helps to ascertain the present value of future cash flows by applying a discount rate.

For calculating the present value of single cash flow and annuity the following formula should be used:

Present Value:

Single Cash Flow = Amount X

Annuity = Amount X

Where R = Discount Rate

n = number of years

**Present Worth Analysis**

It is used to compare mutually exclusive alternatives based on present worth, under the assumption that each alternative is expected to provide the same service.

Generally, the cash flows to be considered are: first cost, annual costs, non-recurring costs, revenues, and salvage value.

Example:

XYZ Car Rental Company is considering purchasing one type of compact car to replenish its fleet. Two companies are offering this kind of car. Which option should XYZ choose if their MARR is 10% per year?

Company A Company B

Purchase cost $12,000 $14,000

Maintenance Cost $900 $500

Salvage value $4,000 $5,000

Life (Years) 3 3

Solution:

PWA = -12,000-900(P/A,10%,3)+4,000(P/F,10%,3)

= -12,000-900\*2.4869+4,000\*0.7513

= $ -11,233.01

PWB = -14,000 -500\*(P/A,10%,3) + 5,000(P/F,10%,3)

= $ -11,486.95

PWB < PWA, XYZ should choose car made by Company A.

**MTBF and Product Reliability**

Product Reliability is defined as the probability that a Equipment or a device will perform its essential function, subjected to specified conditions, for a specific period of time. Product Reliability is computed as MTBF (Mean Time Between Failures) for repairable product and MTTF (Mean Time To Failure) for non-repairable product.

**Calculation of MTBF:**

MTBF= T/R where T = total time and R = number of failures

MTTF stands for Mean Time To Failure.

To differentiate between these terms, the concept of suspensions must be understood. In reliability calculations, a suspension occurs when a destructive test or observation has been completed without observing a failure.

MTBF calculations do not consider suspensions whereas MTTF does. MTTF is the number of total hours of service of all devices divided by the number of devices.

It is only when all the parts fail with the same failure mode that MTBF converges to MTTF.

MTTF= T/N where T = total time and N = Number of units under test.

**Example:** Suppose 10 devices are tested for 500 hours. During the test 2 failures occur.

The estimate of the MTBF is:

MTBF= (10\*500)/2 = 2,500 hours / failure.

Whereas for MTTF

MTTF= (10\*500)/10 = 500 hours / failure.