Chapter 1.6 Financial Management

Part – I: Objective type questions and answers

1.	Simple pay back period is equal to: a) Ratio of First cost/net yearly savings b) Ratio of Annual gross cash flow/capital cost c) $\sum_{t=0}^{n}\frac{CF_t}{(1+k)^t}$ d) All the above
2.	Simple payback period for an energy efficient motor that costs Rs. 1.5 lakh to purchase and install and is expected to save Rs. 0.75 lakh per annum is: a) 1.1 years b) 2 years c) 0.75 years d) 2.25 years
3.	Which of the following equation used to calculate the future value of the cash flow? a) NPV $(1 – i)^n$ b) NPV $(1 + i)^n$ c) NPV + $(1 – i)^n$ b) NPV/ $(1 + i)^n$
4.	The NPV of equipment is Rs. 10000 and interest on discount rate is 10%. The future value of the cash flow at the end of 2 years is: a) Rs. 10000 b) Rs. 12,100 c) Rs. 8100 d) Rs. 8264
5.	The cost of replacement of inefficient compressor with an energy efficient compressor in a plant was Rs 5 lakh. The net annual cash flow is Rs 1.25 lakh. The return on investment is: a) 15% b) 20% c) 25% d) 19.35%
6.	The ratio of annual net cash flow to capital cost is ____________ a) Net present value b) Internal rate of return c) Return on investment d) Discount factor
7.	The broad indicator of the annual return expected from initial capital investment is __ a) NPV b) IRR c) ROI d) Discount factor
8.	The sum of present values of all the cash flows associated with it is called ___________ a) Return on Investment b) Internal Rate of Return c) Net Present Value d) None of the above
9.	The factor that reflects the risk of the project while evaluating the present value of the expected future cash flow is ________________ a) Life of the project b) Discount rate c) Capital cost d) All the above
10.	IRR stands for_________ a) Integration rate of return b) Interest return rate c) Internal rate of return d) Investment return rate

11.	For all the expenditures in the plant, the value of cash flow at the end of the year will be a) Positive b) <u>Negative</u> c) Nil d) None of the above
12.	The set net present value to determine internal rate of return is _______ a) 1 b) <u>0</u> c) 10 d) 2
13.	The internal rate of return cannot distinguish between ____________ a) Lending b) Borrowing c) <u>Both a & b</u> d) None
14.	Sensitivity analysis is an assessment of ________________ a) Profits b) Losses c) <u>Risk</u> d) all
15.	The present value of a Rs. 1000 cost in year "0" projected to 10 years at an escalation rate of 5% and a 10% interest rate is: a) Rs. 4225 b) <u>Rs. 628</u> c) Rs. 1 d) Rs. 2.33
16.	The present value of Rs. 1000 in 10 years time at an interest rate of 10% is: a) Rs. 2594 b) <u>Rs. 386</u> c) Rs. 349 d) Rs. 10000
17.	What is ESCO? a) Energy saving company b) Energy sourcing company c) <u>Energy service company</u> d) Energy section of company
18.	ROI must always be ___ than interest rate a) Lower b) <u>Higher</u> c) Equal d) No relation
19.	The key to the successful involvement of an ESCO in performance contracting is: a) Monitoring b) Verification c) <u>Both a & b</u> d) None
20.	Costs associated with the design, planing, installation and commissioning of a project are: a) Variable costs b) <u>Capital costs</u> c) Salvage value d)None

<u>Part – II: Short type questions and answers</u>

1.	List out different costs involved in the process of implementing energy management? Different costs involved in the process of implementing energy management are: i) Direct project cost ii) Additional operations and maintenance cost **iii)** Training of personnel
2.	What circumstances need investments for energy conservation in any plant? The need for investments in energy conservation can arise under following circumstances: i. For new equipment, process improvements etc. ii. To provide staff training iii. To implement or upgrade the energy information system

	iv. And other priorities
3.	What criteria need to be considered while listing down the investment opportunities for any energy conservation project? When listing investment opportunities the following criteria need to be considered: i) Energy consumption per unit of production of a plant or process ii) Current state of repair and energy efficiency iii) Quality of the indoor environment iv) Effect of any proposed measure on staff attitudes and behaviour
4.	Why organizations hesitant to invest money on energy conservation projects? i. Organization typically gives priority to investing in what they see as their core or profit-making activities in preference to energy efficiency ii. Even when they do invest in saving energy, they tend to demand faster rates of return than they require from other kinds of investment.
5.	What are the basic criteria for financial investment appraisal? The basic criteria for financial investment appraisal include • Simple payback period, • Return on investment and internal rate of return • Net present value and cash flow
6.	Why short term payback is an inadequate yardstick for assessing longer term benefits? The benefits arising from some energy saving measures may continue long after their payback periods. Such measures do not need to be written off using fast discounting rates but can be regarded as adding to the long term value of the assets. For this reason, short term payback is an inadequate yardstick for assessing longer term benefits
7.	How do you relate plant maintenance to achieve energy efficiency in a plant? There is a clear dependence relationship between energy efficiency and maintenance. This operates at two levels: ❖ Initially, improving energy efficiency is most cost-effectively done in existing facilities through normal maintenance procedures ❖ Subsequently, unless maintenance is regularly undertaken, savings from installed technical measure, whether in new-build or existing facilities, may not be realized.
8.	List down the advantages with 'Simple Payback period' technique A widely used investment criterion, the simple payback period offers the following advantages: • It is simple, both in concept and application. Obviously a shorter payback generally indicates a more attractive investment. It does not use tedious calculations. • It favours projects, which generate substantial cash inflows in earlier years, and discriminates against projects, which bring substantial cash inflows in later years but not in earlier years.
9.	What are the limitations with Return on Investment technique? The limitations with ROI technique are: ▪ It does not take into account the time value of money. ▪ It does not account for the variable nature of annual net cash inflows.

<table>
<tr><td>10.</td><td>Calculate net present value for an investment towards a Compact Fluorescent Lamp (CFL). The following table gives investment and cash flow. (Assume discount rate is 10% and life of the CFL is 2 years).

Investment Rs.400/-

Savings in year — Cash flow, Rs
Year # 1 — 1000
Year # 2 — 1000

Investment : Rs 400/-
Discount rate (k) : 10% (i.e. 0.1)
Life of the CFL (t) : 2 years

NPV : $\sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$

NPV $= \frac{CF_0}{(1+k)^0} + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2}$

$= \frac{-400}{(1+0.1)^0} + \frac{1000}{(1+0.1)^1} + \frac{1000}{(1+0.1)^2}$

= -400 + 909 + 826
= Rs 1335/-</td></tr>
<tr><td>11.</td><td>What are the main advantages with Net Present Value criterion?
The net present value criterion has considerable merits.
i. it takes in to account the time value of money
ii. it considers the cash flow stream in its project life</td></tr>
<tr><td>12.</td><td>What is the limitation with internal rate of return figure?
The internal rate of return figure cannot distinguish between lending and borrowing and hence a high internal rate of rerun need not necessarily be a desirable feature.</td></tr>
<tr><td>13.</td><td>What are different kinds of cash flows in any energy management project?

Generally there are two kinds of cash flow; the initial investment as one or more instalments, and the savings arising from the investment.</td></tr>
<tr><td>14.</td><td>List down the factors need to be considered in calculating annual cash flows.

Taxes, Asset depreciation and intermittent cash flows</td></tr>
<tr><td>15.</td><td>Under which circumstances sensitivity analysis is required?

Sensitivity analysis is an assessment of risk. Sensitivity analysis is carried out particularly on projects where the feasibility is marginal.</td></tr>
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16.	Calculate the present value of tax cash flow from a Rs. 10,000 investment towards 5 hp energy efficient motor with 30% declining balance depreciation rate, 50% tax rate and 10% interest rate. Present Value = P x d x t / (i + d)= (10000 x 0.3 x 0.5)/ (0.1 + 0.3) = Rs. 3750
17.	List down any three options available for financing in-house energy management? i. From a capital budget ii. From a specific department or section budget iii. By obtaining bank loan iv. By raising money from stock market
18.	How to make energy management self financing? One way to make energy management self financing is to split savings to provide identifiable returns to each interested party.
19.	How an energy manager utilises if he has access to a proportion of the revenue savings arising from staff activities? if, an energy manager has access to a proportion of the revenue savings arising from staff's activities, then these can be reinvested in: ❖ Further energy efficiency measures ❖ Activities necessary to create the right climate for successful energy management which do not, of themselves, directly generate savings ❖ Maintaining or up-grading the management information system.
20.	What do you understand about ESCOs? ESCOs are usually companies that provide a complete energy project service, from assessment to design to construction or installation, along with engineering and project management services, land financing.

<u>Part – III: Long type questions and answers</u>

1.	An energy auditor recommended to replace an old air fan and incompetently designed air delivery duct system causing Rs 23 lakh a year in electricity cost by changing the system with a modern backward curved fan with adequately designed duct system for total investment costs of Rs 2.2 lakh. Expected electricity cost reduction is 5%. Considering over 15 years sustained savings, calculate 'IRR' Life of the modified system : 15 years Expected annual savings : 5% : 0.05 x 2300000 Rs. 1,15,000 / year Investment : Rs 2,20,000/-

	$S = \frac{(1+i)^n \, xi}{(1+i)^n - 1} xI$ S = annual energy savings I = Investment N = years I = Internal rate of return $\frac{115000}{220000} = \frac{(1+i)^{15} xi}{(1+i)^{15} - 1}$ By trial and error method, I = 52%
2.	Annual savings after replacement of boiler for three years is Rs. 5, 00,000, Rs. 5, 50,000, Rs. 6, 50,000. Total project cost is Rs 13.5 lakh. Considering cost of capital as 12%, what is the net present value of the proposal? Cash flow stream of project Investment — Rs 13,50,000 Annual savings — Cashflow 1 — 5,00,000 2 — 5,50,000 3 — 6,50,000 Cost of capital to the plant is 12%. The net present value of the proposal is: NPV = $\frac{500000}{(1.12)^1} + \frac{550000}{(1.12)^2} + \frac{650000}{(1.12)^3}$ = 446428 + 438456 + 462657 = 13,47,541 NPV = 13,50,000-13,47,541 = 2459
3.	What is performance contracting? The core of performance contracting is an agreement involving a comprehensive package of services provided by an ESCO, including: ❖ An energy efficiency opportunity analysis ❖ Project development ❖ Engineering ❖ Financing ❖ Construction/Implementation ❖ Training

	❖ Monitoring and verification Monitoring and verification, is key to the successful involvement of an ESCO in performance contracting where energy cost savings are being guaranteed. ESCOs are not “bankers” in the narrow sense. Their strength is in putting together a package of services that can provide guaranteed and measurable energy savings that serve as the basis for guaranteed cost savings. But, the energy savings must be measurable. The Figure 6.1 shows ESCO Role. Refer “figure No. 6.1 page No. 127 of book I need to form part of answer
4.	Explain the limitations with ‘Simple Payback Period’ technique with an example. The limitations are: • It fails to consider the time value of money. Cash inflows, in the payback calculation, are simply added without suitable discounting. This violates the most basic principle of financial analysis, which stipulates that cash flows occurring at different points of time can be added or subtracted only after suitable compounding/discounting. • It ignores cash flows beyond the payback period. This leads to discrimination against projects that generate substantial cash inflows in later years. To illustrate, consider the cash flows of two projects, A and B:

Investment	Rs. (100,000)	Rs.(100,000)
Savings in Year	Cash Flow of A	Cash flow of B
1	50,000	20,000
2	30,000	20,000
3	20,000	20,000
4	10,000	40,000
5	10,000	50,000
6	-	60,000

The payback criterion prefers A, which has a payback period of 3 years, in comparison to B, which has a payback period of 4 years, even though B has very substantial cash inflows in years 5 and 6.

- It is a measure of a project’s capital recovery, not profitability.
- Despite its limitations, the simple payback period has advantages in that it may be useful for evaluating an investment.

5. Calculate the internal rate of return for the following cash flow of a project.

Year	0	1	2	3	4
Cash flow	(100,000)	30,000	30,000	40,000	45,000

The internal rate of return is the value of "r" which satisfies the following equation:

$$100,000 = \frac{30,000}{(1+\kappa)^1} + \frac{30,000}{(1+\kappa)^2} + \frac{40,000}{(1+\kappa)^3} + \frac{45,000}{(1+\kappa)^4}$$

The calculation of "κ" involves a process of trial and error. Try with different values of "κ" till the right-hand side of the above equation is equal to 100,000. To begin with, try κ = 15 per cent. This makes the right-hand side equal to:

$$\frac{30,000}{(1.15)} + \frac{30,000}{(1.15)^2} + \frac{40,000}{(1.15)^3} + \frac{45,000}{(1.15)^4} = 100,802$$

This value is slightly higher than our target value, 100,000. So increase the value of κ from 15 per cent to 16 per cent. (In general, a higher κ lowers and a smaller r increases the right-hand side value). The right-hand side becomes:

$$\frac{30,000}{(1.16)} + \frac{30,000}{(1.16)^2} + \frac{40,000}{(1.16)^3} + \frac{45,000}{(1.16)^4} = 98,641$$

Since this value is now less than 100,000, it can be concluded that the value of r lies between 15 per cent and 16 per cent. For most of the purposes this indication suffices.