HOMEWORK SECTION - Capital Budgeting

Q1. A project requiring an investment of Rs. 10,00,000 and it yields profit after tax and depreciation which is as follows:

Years	Profit after tax and depreciation (Rs.)
1	50,000
2	75,000
3	1,25,000
4	1,30,000
5	80,000
Total	4,60,000

Suppose further that at the end of the 5th year, the plant and machinery of the project can be sold for Rs. 80,000. DETERMINE Average Rate of Return.

Q2. There are two Project A and Project B are under consideration. The cash flows associated with these projects are as follows:

Year	Project A (Rs.)	Project B (Rs.)
0	(1,00,000)	(3,00,000)
1	50,000	1,40,000
2	60,000	1,90,000
3	40,000	1,00,000

Assuming Cost of Capital equal to 10%, IDENTIFY which project should be accepted as per NPV Method and IRR Method.

Q3. Shiva Limited is planning its capital investment programme for next year. It has five projects all of which give a positive NPV at the company cut-off rate of 15 percent, the investment outflows and present values being as follows:

Project	Investment (Rs.)	NPV @ 15% (Rs.)
A	(50,000)	15,400
B	(40,000)	18,700
C	(25,000)	10,100
D	(30,000)	11,200
E	(35,000)	19,300

The company is limited to a capital spending of Rs. 1,20,000.
You are required to ILLUSTRATE the returns from a package of projects within the capital spending limit. The projects are independent of each other and are divisible (i.e., part- project is possible).

Q4. Alpha Company is considering the following investment projects:

	Cash Flows (Rs.)			
Projects	C0	C1	C2	C3
A	-10,000	+10,000		
B	-10,000	+7,500	+7,500	
C	-10,000	+2,000	+4,000	+12,000
D	-10,000	+10,000	+3,000	+3,000

(a) ANALYSE and rank the projects according to each of the following methods:
(i) Payback, (ii) ARR, (iii) IRR and (iv) NPV, assuming discount rates of 10 and 30 per cent.

(b) Assuming the projects are independent, which one should be accepted? If the projects are mutually exclusive, IDENTIFY which project is the best?

Q5. X Limited is considering purchasing a new plant worth Rs. 80,00,000. The expected net cash flows after taxes and before depreciation are as follows:

Year	Net Cash Flows (Rs.)
1	14,00,000
2	14,00,000
3	14,00,000
4	14,00,000
5	14,00,000
6	16,00,000
7	20,00,000
8	30,00,000
9	20,00,000
10	8,00,000

The rate of cost of capital is 10%. You are required to CALCULATE:

(i) Pay-back period

(ii) Net present value at 10 discount factor

(iii) Profitability index at 10 discount factor

(iv) Internal rate of return with the help of 10% and 15% discount factor.

The following present value table is given for you:

Year	Present value @ 10%	Present value @ 15%
1	0.909	0.870
2	0.826	0.756
3	0.751	0.658
4	0.683	0.572

5	0.621	0.497
6	0.564	0.432
7	0.513	0.376
8	0.467	0.327
9	0.424	0.284
10	0.386	0.247

Q6. HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine has been fully depreciated for tax purposes but has a book value of Rs. 2,40,000 on 31st March 2021. The machine has begun causing problems with breakdowns and it cannot fetch more than Rs. 30,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered Rs. 1,00,000 for the old machine as a trade-in on the new machine which has a price (before allowance for trade-in) of Rs. 4,50,000. The expected life of the new machine is 10 years with salvage value of Rs. 35,000. Further, the company follows a straight line depreciation method but for tax purposes, written down value method depreciation @ 7.5% is allowed considering that this is the only machine in the block of assets.

Given below are the expected sales and costs from both old and new machine:

	Old machine (Rs.)	New machine (Rs.)
Sales	8,10,000	8,10,000
Material cost	1,80,000	1,26,250
Labour cost	1,35,000	1,10,000
Variable overhead	56,250	47,500
Fixed overhead	90,000	97,500
Depreciation	24,000	41,500
PBT	3,24,750	3,87,250
Tax @ 30%	97,425	1,16,175
PAT	2,27,325	2,71,075

From the above information, ANALYSE whether the old machine should be replaced or not if the required rate of return is 10%? Ignore capital gain tax.

PV factors @ 10%:

Year	1	2	3	4	5	6	7	8	9	10
PVF	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386

Q7. Lockwood Limited wants to replace its old machine with a new automatic machine. Two models A and B are available at the same cost of Rs. 5 lakhs each. Salvage value of the old machine is Rs. 1 lakh. The utilities of the existing machine can be used if the company purchases model A. Additional cost of utilities to be purchased in this case will be Rs. 1 lakh. If the company purchases B, then all the existing utilities will have to be replaced with new utilities costing Rs. 2 lakhs. The salvage value of the old utilities will be Rs. 0.20 lakhs. The earnings after taxation are expected to be:

Year	Cash inflows		P.V. Factor @ 15%
	Machine A	Machine B	
1	1,00,000	2,00,000	0.870
2	1,50,000	2,10,000	0.756
3	1,80,000	1,80,000	0.658
4	2,00,000	1,70,000	0.572
5	1,70,000	40,000	0.497
Salvage Value at the end of Year 5	50,000	60,000	

The targeted return on capital is 15%. You are required to (i) COMPUTE, for the two machines separately, net present value, discounted payback period and desirability factor and (ii) STATE which of the machines is to be selected?

Q8. Hindlever Company is considering a new product line to supplement its range of products. It is anticipated that the new product line will involve cash investments of Rs. 7,00,000 at time 0 and Rs. 10,00,000 in year 1. After-tax cash inflows of
Rs. 2,50,000 are expected in year 2, Rs. 3,00,000 in year 3, Rs. 3,50,000 in year 4 and
Rs. 4,00,000 each year thereafter through year 10. Although the product line might be viable even after year 10, the company prefers to be conservative and end all calculations at that time.

(a) If the required rate of return is 15 percent, COMPUTE net present value of the project. Is it acceptable?
(b) ANALYSE what would be the case if the required rate of return were 10 per cent?
(c) CALCULATE its internal rate of return.
(d) COMPUTE the project's payback period.

Q9. Cello Limited is considering buying a new machine which would have a useful economic life of five years, a cost of Rs. 1,25,000 and a scrap value of Rs. 30,000, with 80 per cent of the cost being payable at the start of the project and 20 per cent at the end of the first year. The machine would produce 50,000 units per annum of a new product with an estimated selling price of Rs. 3 per unit. Direct costs would be Rs. 1.75 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be Rs. 40,000 per annum.

In the first year and the second year, special sales promotion expenditure, not included in the above costs, would be incurred, amounting to Rs. 10,000 and Rs. 15,000 respectively.
CALCULATE NPV of the project for investment appraisal, assuming that the company's cost of capital is 10 percent.

Q10. Ae Bee Cee Ltd. is planning to invest in machinery, for which it has to make a choice between the two identical machines, in terms of Capacity, 'X' and 'Y'. Despite being designed differently, both machines do the same job. Further, details regarding both the machines are given below:

Particulars	Machine 'X'	Machine 'Y'
Purchase Cost of the Machine (Rs.)	15,00,000	10,00,000
Life (years)	3	2
Running cost per year (Rs.)	4,00,000	6,00,000

The opportunity cost of capital is 9%.
You are required to IDENTIFY the machine which the company should buy? The present value (PV) factors at 9% are:

Year	t1	t2	t3
PVIF	0.917	0.842	0.772

Q11. Alley Pvt. Ltd. is planning to invest in machinery that would cost Rs. 1,00,000 at the beginning of year 1. Net cash inflows from operations have been estimated at Rs. 36,000 per annum for 3 years. The company has two options for smooth functioning of the machinery - one is service, and another is replacement of parts. If the company opts to service a part of the machinery at the end of year 1 at Rs. 20,000, in such a case, the scrap value at the end of year 3 will be Rs. 25,000. However, if the company decides not to service the part, then it will have to be replaced at the end of year 2 at Rs. 30,800, and in this case, the machinery will work for the 4th year also and get operational cash inflow of Rs. 36,000 for the 4th year. It will have to be scrapped at the end of year 4 at Rs. 18,000.
Assuming cost of capital at 10% and ignoring taxes, DETERMINE the purchase of this machinery based on the net present value of its cash flows.
If the supplier gives a discount of Rs. 10,000 for purchase, what would be your decision?
Note: The PV factors at 10% are:

Year	0	1	2	3	4	5	6
PV Factor	1	0.9091	0.8264	0.7513	0.6830	0.6209	0.5645

Q12. NavJeevani hospital is considering purchasing a machine for medical projectional radiography which is priced at Rs. 2,00,000. The projected life of the machine is 8 years and has an expected salvage value of Rs. 18,000 at the end of 8th year. The annual operating cost of the machine is Rs. 22,500. It is expected to generate revenues of Rs. 1,20,000 per year for eight years. Presently, the hospital is outsourcing the radiography work to its neighbour Test Center and is earning commission income of Rs. 36,000 per annum, **net of taxes.**

Required: ANALYSE whether it would be profitable for the hospital to purchase the machine. Give your recommendation under:

(i) Net Present Value method

(ii) Profitability Index method

Consider tax @30%. PV factors at 10% are given below:

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467

Q13. XYZ Ltd. is planning to introduce a new product with a project life of 8 years. Initial equipment cost will be Rs. 3.5 crores. Additional equipment costing Rs. 25,00,000 will be purchased at the end of the third year from the cash inflow of this year. At the end of 8 years, the original equipment will have no resale value, but additional equipment can be sold for Rs. 2,50,000. A working capital of Rs. 40,00,000 will be needed and it will be released at the end of eighth year. The project will be financed with a sufficient amount of equity capital.

The sales volumes over eight years have been estimated as follows:

Year	1	2	3	4 - 5	6 - 8
Units per year	72,000	1,08,000	2,60,000	2,70,000	1,80,000

A sales price of Rs. 240 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating costs will amount to Rs. 36,00,000 per year. The loss of any year will be set off from the profits of subsequent two years. The company is subject to 30 percent tax rate and considers 12 percent to be an appropriate after-tax cost of capital for this project. The company follows a straight line method of depreciation.

CALCULATE the net present value of the project and advise the management to take appropriate decisions. The PV factors at 12% are

Year	1	2	3	4	5	6	7	8
PV Factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

Q14. A large profit making company is considering the installation of a machine to process the waste produced by one of its existing manufacturing processes to be converted into a marketable product. At present, the waste is removed by a contractor for disposal on payment by the company of Rs. 150 lakh per annum for the next four years. The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of Rs. 90 lakh before the processing operation starts. This compensation is not allowed as deduction for tax purposes.

The machine required for carrying out the processing will cost Rs. 600 lakh. At the end of the 4^{th} year, the machine can be sold for Rs. 60 lakh and the cost of dismantling and removal will be Rs. 45 lakh.

Sales and direct costs of the product emerging from waste processing for 4 years are estimated as under: (Rs. In lakh)

Year	1	2	3	4
Sales	966	966	1,254	1,254
Material consumption	90	120	255	255
Wages	225	225	255	300
Other expenses	120	135	162	210
Factory overheads	165	180	330	435
Depreciation (as per income tax rules)	150	114	84	63

Initial stock of materials required before commencement of the processing operations is Rs. 60 lakh at the start of year 1. The stock levels of materials to be maintained at the end of year 1, 2 and 3 will be Rs. 165 lakh and the stocks at the end of year 4 will be nil. The storage of materials will utilise space which would otherwise have been rented out for Rs. 30 lakh per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of Rs. 45 lakh in the year- 1 and Rs. 30 lakh in the year- 2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of Rs. 90 lakh per annum payable on this venture. The company's tax rate is 30%.

Consider cost of capital @ 14%, the present value factors of which is given below for four years:

Year	1	2	3	4
PV factors @14%	0.877	0.769	0.674	0.592

ADVISE the management on the desirability of installing the machine for processing the waste. All calculations should form part of the answer.

Q15. Xavly Ltd. has a machine which has been in operation for 3 years. The machine has a remaining estimated useful life of 5 years with no salvage value in the end. Its current market value is Rs. 2,00,000. The company is considering a proposal to purchase a new model of machine to replace the existing machine. The relevant information is as follows:

	Existing Machine	New Machine
Cost of machine	Rs. 3,30,000	Rs. 10,00,000
Estimated life	8 years	5 years
Salvage value	Nil	Rs. 40,000
Annual output	30,000 units	75,000 units
Selling price per unit	Rs. 15	Rs. 15
Annual operating hours	3,000	3,000
Material cost per unit	Rs. 4	Rs. 4

Labour cost per hour	Rs. 40	Rs. 70
Indirect cash cost per annum	Rs. 50,000	Rs. 65,000

The company uses a written down value of depreciation @ 20% and it has several other machines in the block of assets. The Income tax rate is 30 percent and Xavly Ltd. does not make any investment, if it yields less than 12 per cent.

ADVISE Xavly Ltd. whether the existing machine should be replaced or not. PV factors @12%:

Year	1	2	3	4	5
PVF	0.893	0.797	0.712	0.636	0.567

Q15. XYZ Ltd. is presently all equity financed. The directors of the company have been evaluating investment in a project which will require Rs. 270 lakhs capital expenditure on new machinery. They expect the capital investment to provide annual cash flows of Rs. 42 lakhs indefinitely which is net of all tax adjustments. The discount rate which it applies to is 14% net.

The directors of the company believe that the current capital structure fails to take advantage of tax benefits of debt and propose to finance the new project with undated perpetual debt secured on the company's assets. The company intends to issue sufficient debt to cover the cost of capital expenditure and the after tax cost of issue.

The current annual gross rate of interest required by the market on corporate undated debt of similar risk is 10%. The after tax costs of the issue are expected to be Rs. 10 lakhs. Company's tax rate is 30%.

You are REQUIRED to:

(i) Calculate the adjusted present value of the investment,

(ii) Calculate the adjusted discount rate and

(iii) Explain the circumstances under which this adjusted discount rate may be used to evaluate future investments. **(THIS QUESTION IS ADVANCED. NOT REQUIRED. JUST THERE IN MODULE. HENCE, PUT IT HERE WITH SOLUTION)**

Ans.

(i) Calculation of Adjusted Present Value of Investment (APV)

Adjusted PV = Base Case PV + PV of financing decisions associated with the project Base Case NPV for the project: = (-) Rs. 270 lakhs + (Rs. 42 lakhs / 0.14) = (-) Rs. 270 lakhs + Rs. 300 lakhs = Rs. 30

Issue costs = Rs. 10 lakhs

Thus, the amount to be raised = Rs. 270 lakhs + Rs. 10 lakhs

= Rs. 280 lakhs Annual tax relief on interest payment = Rs. 280 X 0.1 X 0.3

= Rs. 8.4 lakhs in perpetuity The value of tax relief in perpetuity = Rs. 8.4 lakhs / 0.1

= Rs. 84 lakhs

Therefore, APV = Base case PV – Issue Costs + PV of Tax Relief on debt interest

= Rs. 30 lakhs – Rs. 10 lakhs + 84 lakhs = Rs. 104 lakhs

(ii) Calculation of Adjusted Discount Rate (ADR)

Annual Income / Savings required to allow an NPV to zero Let the annual income be x.

(-) Rs.280 lakhs X (Annual Income / 0.14) = (-) Rs.104 lakhs Annual Income / 0.14

= (-) Rs. 104 + Rs. 280 lakhs

Therefore, Annual income = Rs. 176 X 0.14 = Rs. 24.64 lakhs Adjusted discount rate

= (Rs. 24.64 lakhs / Rs.280 lakhs) X 100 = 8.8%

(iii) Useable circumstances

This ADR may be used to evaluate future investments only if the business risk of the new venture is identical to the one being evaluated here and the project is to be financed by the same method on the same terms. The effect on the company's cost of capital of introducing debt into the capital structure cannot be ignored.