



Financial Management

(Solutions)

Semester-VI

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Contents

SEMESTER–VI

| | |
|---|----|
| 2. Time Value of Money | 3 |
| 3. Capital Budgeting | 7 |
| 4. Cost of Capital | 41 |
| 6. Capital Structure | 55 |
| 7. Leverages | 65 |
| 8. Working Capital Management | 74 |
| 9. Dividend Policy | 95 |

FINANCIAL MANAGEMENT

(Solutions)

Semester–VI

2

Time Value of Money

■ Numerical Questions

1. Mr. Ram deposited ₹ 4,500 at 7% annual interest into his bank account. What will be the worth of his deposit if he left it in the bank for nine years?

Sol. $FV_n = PV(1+r)^n$

$$= 4,500\left(1 + \frac{7}{100}\right)^9$$
$$= ₹ 8273.07$$

2. Ms Surbhi invested 80,000 in a 3-year certificate of deposit. This CD offers a stated annual interest rate of 10% compounded quarterly. How much will she have at the end of three years?

Sol. $FV_n = PV\left(1 + \frac{r}{m}\right)^{mn}$

m = frequency of compounding per year

$$= 80,000\left(1 + \frac{10}{4 \times 100}\right)^{4 \times 3}$$
$$= 80,000 \times 1.34$$
$$= ₹ 107,591$$

3. What will a deposit of ₹ 4,500 at 12% compounded monthly be worth at the end of 10 years?

Sol. $FV_n = PV\left(1 + \frac{r}{m}\right)^{mn}$

$$= 4,500\left(1 + \frac{12}{12 \times 100}\right)^{12 \times 10}$$
$$= 4,500 \times (1.01)^{120}$$
$$= 4,500 \times 3.300387$$
$$= 14,851.74$$

4. Shri. R.L. Mehta made investments as follow:

₹ 1000 at the end of year 1,

₹ 2,000 at the end of year 2,

₹ 3,000 at the end of year 3,

₹ 4,000 at the end of year 4,

₹ 5,000 at the end of year 5.

You are required to find the future value of five cash flows.

- Sol.** The future value of this series of payment will be:

| End of Year | Amount of Payments | No. of years Compounded | Compound Interest factor | Future Value |
|-------------|--------------------|-------------------------|--------------------------|--------------|
| 1 | 1,000 | 4 | 1.464 | 1,464 |
| 2 | 2,000 | 3 | 1.331 | 2,662 |
| 3 | 3,000 | 2 | 1.210 | 3,630 |
| 4 | 4,000 | 1 | 1.100 | 4,400 |
| 5 | 5,000 | 0 | 1.000 | 5,000 |
| | | | | 17,156 |

5. Ria purchases a contract from an insurance company. The contract promises to pay ₹600,000 after 8 years with a 5% return rate. What amount of money should Ria most likely invest today?

Sol.

$$PV = \frac{FV_n}{(1+i)^n}$$

$$PV = \frac{6,00,000}{(1+.05)^8}$$

$$= 6,00,000 \times 0.67684 \text{ (from discount factor table)}$$

$$= ₹ 4,06,104$$

6. Ruhan will receive ₹100 after one year and the stated annual rate is 12%, compounded monthly.

Sol.

$$PV = \frac{FV_n}{\left(1 + \frac{i}{M}\right)^{nm}}$$

$$= \frac{100}{\left(1 + \frac{10}{12}\right)^{1 \times 12}}$$

$$= 100 \times 0.887449 = ₹ 88.74$$

7. Mr. Rati Ram deposits ₹ 650 per year at an annual interest rate of 6 percent for 8 years? Find out the amount he will receive after 8 years.

$$\begin{aligned} \text{Sol. } PV_n &= (R)(ACF_{r,n}) \\ &= 650 (ACF_{6,8}) = 650 \times 9.897 \\ &= ₹ 6,433 \end{aligned}$$

8. What is the present value of ₹ 800 to be received at the end of 8 years, assuming an annual interest rate of 8 percent?

$$\begin{aligned} \text{Sol. } PV &= \frac{FV}{(1+i)^n} = \frac{800}{(1+8\%)^8} \\ &= 800 \times 0.54027 = ₹ 432 \end{aligned}$$

9. What is the present value of ₹ 800 to be received at the end of 8 years, assuming an interest rate of 20 percent, quarterly compounding?

$$\begin{aligned} \text{Sol. } PV &= \frac{FV}{\left(1 + \frac{i}{M}\right)^{nm}} = \frac{800}{\left(1 + \frac{.20}{4}\right)^{8 \times 4}} \\ &= 800 \times 0.209866 = ₹ 167 \end{aligned}$$

10. What would you receive for an ordinary annuity of ₹ 2,000 paid every six months for 12 years if you could invest your money elsewhere at a nominal interest rate of 10% compounded semi-annually?

$$\begin{aligned} \text{Sol. } FV &= 2,000 \left(1 + \frac{10}{2 \times 100}\right)^{12 \times 2} \\ &= 2,000 \times 13.7986 \\ &= ₹ 27597.20 \end{aligned}$$

11. How much do Mr. X need to invest at 8% per year, in order to have ₹ 10,000 in:

- One year:
- Two years:
- Ten years

$$\begin{aligned} \text{Sol. } PV &= \frac{FV_n}{(1+i)^n} \\ \text{(a)} &= \frac{10,000}{(1+0.08)^1} \\ &= 10,000 \times 0.92593 = ₹ 9,259.26 \\ \text{(b)} &= \frac{10,000}{(1+0.08)^2} \\ &= 10,000 \times 0.85734 = ₹ 8,573 \end{aligned}$$

$$(c) = \frac{10,000}{(1 + 0.08)^{10}}$$

$$= 10,000 \times .4631.9 = ₹4631.9$$

12. Mr. Rohit invested ₹10,000. During the first year the investment earned 20% for the year. During the second year, he earned only 4% for that year. How much is his original deposit worth at the end of the two years?

Sol. $FV = R(1 + r)^n$

$$= 10,000 (1 + .20) (1 + 0.04) = ₹12,480$$

13. What is the value of the following set of cash flows today? The interest rate is 8% for all cash flows.

Year and Cash Flow

1: ₹ 300 2: ₹ 500 3: ₹ 700 4: ₹ 1000

Sol.

| Year | Cash Flow | PV @ 8% | PV of Cash Flows |
|------|-----------|---------|------------------|
| 1 | 300 | 0.926 | 277.8 |
| 2 | 500 | 0.857 | 428.5 |
| 3 | 700 | 0.794 | 555.8 |
| 4 | 1,000 | 0.735 | 735 |
| | | | 1997.1 |

14. What is the present value of a 4-year annuity, if the annual interest is 5%, and the annual payment is ₹ 1,000?

Sol.

| Year | Payment | P.V. @ 5% | Present Value |
|------|---------|-----------|---------------|
| 1 | 1,000 | 0.952 | 952 |
| 2 | 1,000 | 0.907 | 907 |
| 3 | 1,000 | 0.864 | 864 |
| 4 | 1,000 | 0.823 | 823 |
| | | | 3,546 |



3

Capital Budgeting

1. A project costs ₹40,00,000 and yields annually a profit of ₹6,00,000 after depreciation @ 12 1/2% but before tax at 50%. Calculate the payback period.

Sol. Payback Period = $\frac{\text{Outflow}}{\text{Inflow}} = \frac{40,00,000}{8,00,000} = 5$ years

Profit = 6,00,000

Less: Tax = 3,00,000

= 3,00,000

Add: depreciation = 5,00,000

Profit after tax before depreciation = 8,00,000

2. ABC Ltd. is considering two projects. Each requires an investment of ₹10,00,000. The net cash inflows from investment in the two projects X and Y are as follows:

| Years | X (₹) | Y (₹) |
|-------|-------|-------|
| 1 | 5,000 | 1,000 |
| 2 | 4,000 | 2,000 |
| 3 | 3,000 | 3,000 |
| 4 | 1,000 | 4,000 |
| 5 | — | 5,000 |
| 6 | — | 6,000 |

The company has fixed three years payback period as the cut-off point. State which project should be accepted.

Sol. Project X

| Years | Inflows | Cumulative |
|-------|---------|------------|
| 1 | 5,000 | 5,000 |
| 2 | 4,000 | 9,000 |
| 3 | 3,000 | 12,000 |
| 4 | 1,000 | 13,000 |

Payback Period = 2 years + $\frac{1,000}{3,000} = 2\frac{1}{3}$ years

Project Y

| Years | Inflows | Cumulative |
|-------|---------|------------|
| 1 | 1,000 | 1,000 |
| 2 | 2,000 | 3,000 |
| 3 | 3,000 | 6,000 |
| 4 | 4,000 | 10,000 |
| 5 | 5,000 | 15,000 |
| 6 | 6,000 | 21,000 |

Payback Period = 4 years

Hence, Project X should be accepted.

3. Each of the following projects requires a cash outlay of ₹10,000. You are required to suggest which project should be accepted if the standard payback period is 5 years:

| Years | Cash Inflows | | |
|-------|--------------|-------|-------|
| | X (₹) | Y (₹) | Z (₹) |
| 1 | 2,500 | 4,000 | 1,000 |
| 2 | 2,500 | 3,000 | 2,000 |
| 3 | 2,500 | 2,000 | 3,000 |
| 4 | 2,500 | 1,000 | 4,000 |
| 5 | 2,500 | — | — |

Sol.

| Years | Project X | | Project Y | | Project Z | |
|-------|-----------|------------|-----------|------------|-----------|------------|
| | Inflows | Cumulative | Inflows | Cumulative | Inflows | Cumulative |
| 1 | 2,500 | 2,500 | 4,000 | 4,000 | 1,000 | 1,000 |
| 2 | 2,500 | 5,000 | 3,000 | 7,000 | 2,000 | 3,000 |
| 3 | 2,500 | 7,500 | 2,000 | 9,000 | 3,000 | 6,000 |
| 4 | 2,500 | 10,000 | 1,000 | 10,000 | 4,000 | 10,000 |
| 5 | 2,500 | 12,500 | — | — | — | — |

Payback Period

Project X = 4 years

Project Y = 4 years

Project Z = 4 years

Payback Period in each case is 4 years. However, Project Y is the best out of all since in its case cash inflows are higher in initial years.

4. A company has to choose one of the following two mutually exclusive projects. Both the projects have to be depreciated on straight line basis. The tax is 50%.

| Years | Cash Inflows | |
|-------|---------------|---------------|
| | Project A (₹) | Project B (₹) |
| 0 | -15,000 | - 15,000 |
| 1 | 4,200 | 4,200 |
| 2 | 4,800 | 4,500 |
| 3 | 7,000 | 4,000 |
| 4 | 8,000 | 5,000 |
| 5 | 2,000 | 10,000 |

You have to use Payback period as the criterion.

Calculation of Payback Period

| Years | Project A Outflow = ₹ 15,000 | Project B Outflow = ₹ 15,000 |
|-------|------------------------------|------------------------------|
| | Inflows | Inflows |
| 1 | 4,200 | 4,200 |
| 2 | 4,800 | 4,500 |
| 3 | 7,000 | 4,000 |
| 4 | 8,000 | 5,000 |
| 5 | 2,000 | 10,000 |

$$\text{Payback Period} = 2 \text{ years} + \frac{1,000}{7,000} = 2.9 \text{ years}$$

$$\text{Payback Period} = 3 \text{ years} + \frac{2,300}{5,000} = 3.46 \text{ years}$$

Project A should be preferred.

Note: It is assumed that inflows are after tax but before depreciation.

5. A company wants to purchase a plant for its expanding operations. The desired plant is available at ₹6,00,000 in cash or ₹2,00,000 to be paid in five equal annual instalments due at the end of each year. Assuming the required rate of returns is 15% which option should the company exercise ?

Sol. (A) Cash Option

| Outflows | Period | P.V. of ₹ 1 | P.V. of Outflows |
|----------|--------|-------------|------------------|
| 6,00,000 | 0 | 1 | 6,00,000 |
| | | | <u>6,00,000</u> |

(B) Instalments

| | | | |
|----------|--------|-------------|------------------|
| Outflows | Period | P.V. of ₹ 1 | P.V. of Outflows |
| 2,00,000 | 1-5 | 3.35 | 6,70,000 |
| | | | <u>6,70,000</u> |

Cash option is to be selected. Because outflows is less as compared to Instalment.

6. J Ltd. is considering the purchase of a machine. Two machines are available, A and B, each costing ₹50,000. In comparing the profitability of the machines, a discount rate of 10% is to be used. Earnings after taxation are expected to be as follows:

| Years | Cash Inflows | |
|-------|---------------|---------------|
| | Project A (₹) | Project B (₹) |
| 1 | 15,000 | 5,000 |
| 2 | 20,000 | 15,000 |
| 3 | 25,000 | 20,000 |
| 4 | 15,000 | 30,000 |
| 5 | 10,000 | 20,000 |

Ascertain the more profitable machine:

Sol. Project A

| Years | Inflows after Tax | | Depreciation | | Cash Flows after Tax before Depreciation |
|-------|-------------------|---|--------------|---|--|
| 1 | 15,000 | + | 10,000 | = | 25,000 |
| 2 | 20,000 | + | 10,000 | = | 30,000 |
| 3 | 25,000 | + | 10,000 | = | 35,000 |
| 4 | 15,000 | + | 10,000 | = | 25,000 |
| 5 | 10,000 | + | 10,000 | = | 20,000 |

| | CFAT | P.V. of ₹ 1 @ 10% | P.V. of Inflows |
|---|--------|-------------------|-----------------|
| 1 | 25,000 | 0.909 | 22,725 |
| 2 | 30,000 | 0.826 | 24,780 |
| 3 | 35,000 | 0.751 | 26,285 |
| 4 | 25,000 | 0.683 | 17,075 |
| 5 | 20,000 | 0.621 | 12,420 |
| | | | 1,03,285 |

$$\begin{aligned}
 \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\
 &= 1,03,285 - 50,000 \\
 &= ₹53,285
 \end{aligned}$$

Project B

| Years | Inflows after Tax | | Depreciation | | Cash flows after tax before Depreciation |
|-------|-------------------|---|--------------|---|--|
| 1 | 5,000 | + | 10,000 | = | 15,000 |
| 2 | 15,000 | + | 10,000 | = | 25,000 |
| 3 | 20,000 | + | 10,000 | = | 30,000 |
| 4 | 30,000 | + | 10,000 | = | 40,000 |
| 5 | 20,000 | + | 10,000 | = | 30,000 |

| | CFAT | P.V. of ₹ 1 @ 10% | P.V. of Inflows |
|---|--------|-------------------|-----------------|
| 1 | 15,000 | 0.909 | 13,635 |
| 2 | 25,000 | 0.826 | 20,650 |
| 3 | 30,000 | 0.751 | 22,530 |
| 4 | 40,000 | 0.683 | 27,320 |
| 5 | 30,000 | 0.621 | 18,630 |
| | | | 1,02,765 |

$$\text{NPV} = \text{P.V. of Inflows} - \text{P.V. of Outflows}$$

$$= 1,02,765 - 50,000 = ₹ 52,765$$

7. A company has an investment opportunity costing ₹40,000 with the following expected net cash flow (i.e., after taxes and before depreciation)

| Years | Net Cash Flow (₹) |
|-------|-------------------|
| 1 | 7,000 |
| 2 | 7,000 |
| 3 | 7,000 |
| 4 | 7,000 |
| 5 | 7,000 |
| 6 | 8,000 |
| 7 | 10,000 |
| 8 | 15,000 |
| 9 | 10,000 |
| 10 | 4,000 |

Using 10% as the cost of capital (rate of discount) determine the following:

- Payback period.
- Net present value at 10% discounting factor.
- Profitability index at 10% discounting factor.
- Internal rate of return with the help of 10% and 15% discounting factors.

Sol. (a) Payback period

| Years | Inflows (₹) | Cumulative (₹) |
|-------|----------------|-------------------|
| 1 | 7,000 | 7,000 |
| 2 | 7,000 | 14,000 |
| 3 | 7,000 | 21,000 |
| 4 | 7,000 | 28,000 |
| 5 | 7,000 | 35,000 |
| 6 | 8,000 | 43,000 |
| 7 | 10,000 | 53,000 |
| 8 | 15,000 | 68,000 |
| 9 | 10,000 | 78,000 |
| 10 | 4,000 | 82,000 |

$$\text{Payback Period} = 5 + \frac{5,000}{8,000} = 5.625 \text{ years}$$

(b) Net present value at 10% discounting factor

| Years | Net Cash flows (₹) | P.V. of ₹ 1 @10% | P.V. of Inflows |
|-------|-----------------------|------------------|-----------------|
| 1 | 7,000 | 0.909 | 6,363 |
| 2 | 7,000 | 0.826 | 5,782 |
| 3 | 7,000 | 0.751 | 5,257 |
| 4 | 7,000 | 0.683 | 4,781 |
| 5 | 7,000 | 0.621 | 4,347 |
| 6 | 8,000 | 0.564 | 4,512 |
| 7 | 10,000 | 0.513 | 5,130 |
| 8 | 15,000 | 0.467 | 7,005 |
| 9 | 10,000 | 0.424 | 4,240 |
| 10 | 4,000 | 0.386 | 1,544 |
| | | | 48,961 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 48,961 - 40,000 = ₹ 8,961 \end{aligned}$$

(c) Profitability index at 10% discounting factor

$$= \frac{\text{P.V. of Inflows}}{\text{P.V. of Outflows}} = \frac{48,961}{40,000} = 1.224$$

(d) Internal rate of return with the help of 10% and 15% discounting factors

| Years | Net Cash flows (₹) | P.V. of ₹ 1 @10% | P.V. of Inflows | 15% | P.V. of Inflows |
|-------|--------------------|------------------|-----------------|-------|-----------------|
| 1 | 7,000 | 0.909 | 6,363 | 0.870 | 6,090 |
| 2 | 7,000 | 0.826 | 5,782 | 0.756 | 5,292 |
| 3 | 7,000 | 0.751 | 5,257 | 0.658 | 4,606 |
| 4 | 7,000 | 0.683 | 4,781 | 0.572 | 4,004 |
| 5 | 7,000 | 0.621 | 4,347 | 0.497 | 3,479 |
| 6 | 8,000 | 0.564 | 4,512 | 0.432 | 3,456 |
| 7 | 10,000 | 0.513 | 5,130 | 0.376 | 3,760 |
| 8 | 15,000 | 0.467 | 7,005 | 0.327 | 4,905 |
| 9 | 10,000 | 0.424 | 4,240 | 0.284 | 2,840 |
| 10 | 4,000 | 0.386 | 1,544 | 0.247 | 988 |
| | | | 48,961 | | 39,420 |

$$10\% + \frac{8,961}{8,961 + 580} \times 5\% = 14.7\%$$

8. Project X initially costs ₹30,000. It generates the following cash flows:

| Years | Cash Inflows (₹) | Present Value of ₹ 1 at 10% |
|-------|------------------|-----------------------------|
| 1 | 9,000 | 0.909 |
| 2 | 8,000 | 0.826 |
| 3 | 7,000 | 0.751 |
| 4 | 6,000 | 0.683 |
| 5 | 5,000 | 0.621 |

Taking the cut off rate as 10%, suggest whether the project should be accepted or not.

Sol.

Calculation of NPV

| Years | Cash Inflows | P. V. of ₹ 1 @ 10% | P. V. of Inflows |
|-------|--------------|--------------------|------------------|
| 1 | 9,000 | 0.909 | 8,181 |
| 2 | 8,000 | 0.826 | 6,608 |
| 3 | 7,000 | 0.751 | 5,257 |
| 4 | 6,000 | 0.683 | 4,098 |
| 5 | 5,000 | 0.621 | 3,105 |
| | | | 27,249 |

$$\text{NPV} = \text{P.V. of Outflows} - \text{P.V. of Inflows}$$

$$= 30,000 - 27,249 = 2,751$$

As Inflows are less than outflows. Hence, project is rejected.

9. There are two projects X and Y. X required an investment of ₹26,000 while Y requires an investment of ₹38,000. The cost of capital is 12%. On the basis of the following cash inflows and present value of ₹1 at 12%, you are required to state which project should be accepted:

| Years | Cash Inflows | | Present value of ₹1 at 12% |
|-------|---------------|---------------|----------------------------|
| | Project X (₹) | Project Y (₹) | |
| 1 | 9,000 | 8,000 | 0.893 |
| 2 | 7,000 | 10,000 | 0.797 |
| 3 | 6,000 | 12,000 | 0.712 |
| 4 | 5,000 | 14,000 | 0.636 |
| 5 | 4,000 | 8,000 | 0.567 |
| 6 | 4,000 | 2,000 | 0.507 |
| 7 | 3,000 | 16,000 | 0.452 |
| 8 | 3,000 | — | 0.404 |
| 9 | 3,000 | — | 0.361 |
| 10 | 3,000 | — | 0.322 |

Sol. Project X

| Years | Cash Inflows | P.V. of ₹ 1 at 12% | P.V. of Inflows |
|-------|--------------|--------------------|-----------------|
| 1 | 9,000 | 0.893 | 8,037 |
| 2 | 7,000 | 0.797 | 5,579 |
| 3 | 6,000 | 0.712 | 4,272 |
| 4 | 5,000 | 0.636 | 3,180 |
| 5 | 4,000 | 0.567 | 2,268 |
| 6 | 4,000 | 0.507 | 2,028 |
| 7 | 3,000 | 0.452 | 1,356 |
| 8 | 3,000 | 0.404 | 1,212 |
| 9 | 3,000 | 0.361 | 1,083 |
| 10 | 3,000 | 0.322 | 966 |
| | | | 29,981 |

$$\begin{aligned}
 \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\
 &= 29,981 - 26,000 \\
 &= ₹ 3,981
 \end{aligned}$$

Project Y

| Years | Cash Inflows | P.V. of ₹1 at 12% | P.V. of Inflows |
|-------|--------------|-------------------|-----------------|
| 1 | 8,000 | 0.893 | 7,144 |
| 2 | 10,000 | 0.797 | 7,970 |
| 3 | 12,000 | 0.712 | 8,544 |
| 4 | 14,000 | 0.636 | 8,904 |
| 5 | 8,000 | 0.567 | 4,536 |
| 6 | 2,000 | 0.507 | 1,014 |
| 7 | 16,000 | 0.452 | 7,232 |
| | | | 45,344 |

$$NPV = 45,344 - 38,000 = ₹ 7,344$$

Project Y should be accepted.

10. The following are the net cash flows of an investment project:

| Cash Flows (₹) | t ₁ | t ₂ |
|----------------|----------------|----------------|
| t | | |
| - 5,400 | + 3,600 | 14,400 |

Calculate the net present value of the project at discount rates of 10, 15, 20, and 30 per cent.

Sol. P.V. of Outflows

| Outflows | Period | P.V. of ₹ 1 | P.V. of Outflows |
|----------|--------|-------------|------------------|
| 5,400 | 0 | 1 | 5,400 |
| | | | <u>5,400</u> |

| Year | Inflows | P.V. of ₹ 1 @10% | P.V. of Inflows | P.V. of ₹ 1 @15% | P.V. of Inflows | P.V. of ₹ 1 @20% | P.V. of Inflows |
|------|---------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| 1 | 3,600 | 0.909 | 3,272 | 0.870 | 3,132 | 0.833 | 2,999 |
| 2 | 14,400 | 0.826 | 11,894 | 0.756 | 10,886 | 0.694 | 9,994 |
| | | | 15,166 | | | 14,018 | 12,993 |

P.V. of ₹ 1 @30%

P.V. of Inflows

| | | |
|----|-------|---------------|
| 1. | 0.769 | 2,768 |
| 2. | 0.592 | 8,525 |
| | | <u>11,293</u> |

NPV = P.V. of Inflows – P.V. of Outflows

$$15,166 - 5,400 = 9,766$$

$$14,018 - 5,400 = 8,618$$

$$12,993 - 5,400 = 7,593$$

$$11,293 - 5,400 = 5,893$$

11. G. Company is evaluating a project with following cash flows:

| | (₹) |
|----------------|-------|
| t ₁ | 1,000 |
| t ₂ | 800 |
| t ₃ | 600 |
| t ₄ | 400 |
| t ₅ | 200 |

The cost of capital is 10%. What is the maximum amount the company should pay for the machine?

Sol. Calculation of Maximum Amount

| Year | Inflows | P.V. of ₹1 @ 10% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 1,000 | 0.909 | 909 |
| 2 | 800 | 0.826 | 660.8 |
| 3 | 600 | 0.751 | 450.6 |
| 4 | 400 | 0.683 | 273.2 |
| 5 | 200 | 0.621 | 124.2 |
| | | | 2,417.8 |

12. A machine will cost ₹10,000. It is expected to provide profits before depreciation of ₹3,000 each in years 1 and 2 and ₹4,000 each in years 3 and 4. Assuming a straight-line depreciation and no taxes, what is the average accounting rate of return?

Sol. Calculation of Average Accounting Rate of Return

$$\text{Average Investment} = \frac{10,000}{2} = 5,000$$

| Year | Profits | Depreciation | Profit after depreciation |
|------|---------|--------------|---------------------------|
| 1 | 3,000 | 2,500 | 500 |
| 2 | 3,000 | 2,500 | 500 |
| 3 | 4,000 | 2,500 | 1,500 |
| 4 | 4,000 | 2,500 | 1,500 |
| | | | 4,000 |

$$\text{Average Profit} = \frac{4,000}{4} = 1,000$$

$$= \frac{\text{Average Profit}}{\text{Average Investment}} \times 100 = \frac{1,000}{5,000} \times 100 = 20\%$$

13. A company is considering investment in a project which requires an initial investment of ₹50,000 and is expected to generate cash inflows of ₹10,000 each year for 8 years. Calculate Internal Rate of Return.

Sol. Calculation of Internal Rate of Return

| Year | Inflows | P.V. of ₹ 1 @10% | P.V. of Inflows | P.V. of ₹ 1 @12% | P.V. of Inflows |
|------|---------|------------------|-----------------|------------------|-----------------|
| 1-8 | 10,000 | 5.334 | 53,340 | 4.968 | 49,680 |
| | | | 53,340 | | 49,680 |

$$\begin{aligned} \text{IRR} &= 10\% + \frac{3,340}{3,340 + 320} \times 2\% \\ &= 11.82\% \end{aligned}$$

14. A project costs ₹20,000 and is expected to generate cash inflows of ₹5,000 each for 5 years. Calculate the internal rate of return.

Sol. Calculation of Internal Rate of Return

| Year | Inflows | P.V. @ 5% | P.V. of Inflows | P.V. @8% | P.V. of Inflows |
|------|---------|-----------|-----------------|----------|-----------------|
| 1-5 | 5,000 | 4.33 | 21,650 | 3.993 | 19,965 |
| | | | 21,650 | | 19,965 |

$$\text{IRR} = 5\% + \frac{1,650}{1,650 + 35} \times 3\% = 7.93\%$$

15. ABC Ltd. is proposing to take up a project which needs an investment of ₹40,000. The net income before depreciation and tax is estimated as follows:

| Years | ₹ |
|-------|--------|
| 1 | 10,000 |
| 2 | 12,000 |
| 3 | 14,000 |
| 4 | 16,000 |
| 5 | 20,000 |

Depreciation is to be charged according to straight line method. Tax rate is 50% calculate the accounting rate of return.

Sol. Calculation of Accounting Rate of Return

| Years | CFB (cash flow before depreciation) | Less: Depreciation | | Less Tax | | Cash Flow after Tax | | |
|-------|-------------------------------------|--------------------|---|----------|---|---------------------|---|-------|
| 1 | 10,000 | 8,000 | = | 2,000 | - | 1,000 | = | 1,000 |
| 2 | 12,000 | 8,000 | = | 4,000 | - | 2,000 | = | 2,000 |
| 3 | 14,000 | 8,000 | = | 6,000 | - | 3,000 | = | 3,000 |
| 4 | 16,000 | 8,000 | = | 8,000 | - | 4,000 | = | 4,000 |
| 5 | 20,000 | 8,000 | = | 12,000 | - | 6,000 | = | 6,000 |
| | | | | | | 16,000 | | |

$$\text{Accounting Rate of Return} = \frac{\text{Average Profit}}{\text{Average Investment}} = \frac{3,200}{20,000} \times 100 = 16\%$$

$$\text{Average Profit} = \frac{16,000}{5} = 3,200$$

$$\text{Average Investment} = \frac{40,000}{2} = 20,000$$

16. A project requires an investment of ₹10,00,000. The plant and machinery required under the project will have a scrap value of ₹80,000 at the end of its useful life of 5 years. The profits after tax and depreciation are estimated to be follows:

| Years | ₹ |
|-------|----------|
| 1 | 50,000 |
| 2 | 75,000 |
| 3 | 1,25,000 |
| 4 | 1,30,000 |
| 5 | 80,000 |

Sol. Calculate the Accounting Rate of Return.

| Years | Profit after Tax and Depreciation |
|----------|-----------------------------------|
| 1 | 50,000 |
| 2 | 75,000 |
| 3 | 1,25,000 |
| 4 | 1,30,000 |
| 5 | 80,000 |
| 4,60,000 | |

$$\text{Average Profit} = \frac{4,60,000}{5} = 92,000$$

$$\text{Average Investment} = \frac{10,00,000}{2} = 5,00,000$$

$$\text{Accounting Rate of Return} = \frac{92,000}{5,00,000} = 18.4\%$$

17. (a) What is payback period in each of the following projects?

Cash Flows (₹)

| Project | C ₀ | C ₁ | C ₂ | C ₃ | C ₄ |
|---------|----------------|----------------|----------------|----------------|----------------|
| A | -5,000 | +1,000 | +1,000 | +3,000 | 0 |
| B | -1,000 | 0 | +1,000 | +2,000 | +3,000 |
| C | -5,000 | +1,000 | +1,000 | +3,000 | +5,000 |

- (b) Given that you wish to use the payback rule with a cut off period of 2 years, which projects would you accept?
- (c) If you use a cut-off period of 3 years, which project would you accept?
- (d) If the opportunity cost of capital is 10%, which projects have positive NPVs?
- (e) “Payback period gives too much weight to cash flows that occur after the cut-off data”. Is it true or false?
- (f) “If a firm uses a single cut-off period for all projects, it is likely to accept too many short-lived projects”. Is it true or false?

Sol. (a) Calculation of Payback Period

Project A Outflow = ₹5,000

| Year | Inflows |
|------|---------|
| 1 | 1,000 |
| 2 | 1,000 |
| 3 | 3,000 |

Payback Period = 3 years

Project B

Outflow = ₹1,000

| Year | Inflows |
|------|---------|
| 1 | 0 |
| 2 | 1,000 |
| 3 | 2,000 |
| 4 | 3,000 |

Payback Period = 2 years

Project C

Outflow = ₹5,000

| Year | Inflows |
|------|---------|
| 1 | 1,000 |
| 2 | 1,000 |
| 3 | 3,000 |
| 4 | 5,000 |

Payback Period = 3 years

(b) Project B should be accepted.

(c) A, B and C should be accepted.

(d) Calculation of NPV.

Project A

| Year | Inflows | P.V. of ₹ 1 @10% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 1,000 | 0.909 | 909 |
| 2 | 1,000 | 0.826 | 826 |
| 3 | 3,000 | 0.751 | 2,253 |
| | | | 3,988 |

NPV = 3,988 – 5,000

= (–) 1,012

Project A has negative NPV.

Project B

| Year | Inflows | P.V. of ₹ 1 @10% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 0 | 0.909 | 0 |
| 2 | 1,000 | 0.826 | 826 |
| 3 | 2,000 | 0.751 | 1,502 |
| 4 | 3,000 | 0.683 | 2,049 |
| | | | 4,377 |

NPV = 4,377 – 1,000 = 3,377

Project B has positive NPV.

Project C

| Year | Inflows | P.V. of ₹ 1 @10% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 1,000 | 0.909 | 909 |
| 2 | 1,000 | 0.826 | 826 |
| 3 | 3,000 | 0.751 | 2,253 |
| 4 | 5,000 | 0.683 | 3,415 |
| | | | 7,403 |

$$NPV = 7,403 - 5,000 = 2,403$$

18. A machine costs ₹8,000 and is expected to produce profits before depreciation of ₹2,500 in each of years 1 and 2 and ₹3,500 in each of years 3 and 4. Assuming that the machine is depreciated at a constant rate of ₹2,000 a year and that there are no taxes, what is the average rate of return?

Sol.

| Year | Inflow before Depreciation | | Depreciation | | Profit after Depreciation |
|------|----------------------------|---|--------------|---|---------------------------|
| 1 | 2,500 | – | 2,000 | = | 500 |
| 2 | 2,500 | – | 2,000 | = | 500 |
| 3 | 3,500 | – | 2,000 | = | 1,500 |
| 4 | 3,500 | – | 2,000 | = | 1,500 |
| | | | | | 4,000 |

$$\text{Depreciation} = \frac{8,000}{4} = 2,000$$

$$\text{Average Profit} = \frac{4,000}{4} = 1,000$$

$$\text{Average Investment} = \frac{8,000}{2} = 4,000$$

$$\text{Accounting Rate of Return} = \frac{1,000}{4,000} \times 100 = 25\%$$

19. Consider projects A and B.

| Project | C ₀ | C ₁ | C ₂ | IRR per cent |
|---------|----------------|----------------|----------------|--------------|
| A | 4,000 | +2,410 | +2,930 | 21 |
| B | 2,000 | +1,310 | +1,720 | 31 |

The opportunity cost of capital is less than 10%. Use the IRR rule to determine which project or projects you should accept if you can undertake both.

Sol. Both project should be accepted. Because IRR is greater than cost of capital.

20. Consider the following projects:

| Project | C ₀ | C ₁ | C ₂ |
|---------|----------------|----------------|----------------|
| A | -1,600 | +1,200 | +1,440 |
| B | -2,100 | +1,440 | +1,728 |

Cash flows (₹)

- (a) Calculate the profitability index for A and B assuming a 20% cost of capital.
 (b) Use the profitability index rule to determine which project you should accept (i) if you could undertake both, and (ii) if you could undertake only one?

Sol. (a) Calculation of Profitability Index

Project A

| Year | Inflows | P.V. of ₹ 1 @20% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 1,200 | 0.833 | 1,000 |
| 2 | 1,440 | 0.694 | 1,000 |
| | | | 2,000 |

$$P.I. = \frac{\text{P.V. of Inflow}}{\text{P.V. of Outflow}} = \frac{2,000}{1,600} = 1.25$$

Project B

| Year | Inflows | P.V. of ₹ 1 @20% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 1,440 | 0.833 | 1,200 |
| 2 | 1,728 | 0.694 | 1,200 |
| | | | 2,400 |

$$P.I. = \frac{\text{P.V. of Inflow}}{\text{P.V. of Outflow}} = \frac{2,400}{2,100} = 1.14$$

(b) (i) Both should be accepted.

(ii) Project A should be accepted. Because it has more profitability Index.

21. B company is considering the purchase of a new machine. There are two machines which will serve the purpose, the details being as follows:

| Years | Machine X (₹) | Machine Y (₹) |
|------------------|---------------|---------------|
| Capital Cost | 1,00,000 | 1,20,000 |
| Annual Savings I | 50,000 | 40,000 |
| II | 50,000 | 40,000 |
| III | Nil | 1,00,000 |

Calculate the rate of return (a) per rupee invested, (b) per rupee invested on annual average basis.

Sol.

| Machine X (₹) | | Machine Y (₹) | |
|---|-----------------|---|----------|
| Outflow = ₹ 1,00,000 | | Outflow = ₹ 1,20,000 | |
| Annual Savings | | Annual Savings | |
| Year | Inflow | Year | Inflow |
| 1 | 50,000 | 1 | 40,000 |
| 2 | 50,000 | 2 | 40,000 |
| | <u>1,00,000</u> | 3 | 1,00,000 |
| Average Profit = $\frac{100,000}{2} = ₹ 50,000$ | | <u>1,80,000</u> | |
| Average Investment = $\frac{100,000}{2} = ₹ 50,000$ | | Average Profit $\frac{180,000}{3} = ₹ 60,000$ | |
| | | Average Investment $\frac{120,000}{2} = ₹ 60,000$ | |

(a) Rate of return per rupee invested

$$\text{Machine X} = \frac{\text{Average Profit}}{\text{Total Investment}} \times 100 = \frac{50,000}{1,00,000} \times 100 = 50\%$$

$$\text{Machine Y} = \frac{60,000}{1,20,000} \times 100 = 50\%$$

(b) Rate of return per rupee invested on annual average basis

$$\text{Machine X} = \frac{\text{Average Profit}}{\text{Average Investment}} = \frac{50,000}{50,000} \times 100 = 100\%$$

$$\text{Machine Y} = \frac{60,000}{60,000} \times 100 = 100\%$$

22. The financial Manager of a company has to advise the Board of Directors on choosing between two competing project proposals which require an equal investment of ₹ 1 lakh and are expected to generate net cash flows as under:

| Project I (End of Years) | Project I | Project II |
|--------------------------|-----------|------------|
| 1 | 48,000 | 20,000 |
| 2 | 32,000 | 24,000 |
| 3 | 20,000 | 36,000 |
| 4 | Nil | 48,000 |
| 5 | 24,000 | 16,000 |
| 6 | 12,000 | 8,000 |

Which project proposal should he recommend and why? Assume the cost of capital to be 10 per cent.

The following are the Present value Factors at 10 per cent per annum:

| Years | P.V. Factor at 10% p.a. |
|-------|-------------------------|
| 1 | 0.909 |
| 2 | 0.826 |
| 3 | 0.751 |
| 4 | 0.683 |
| 5 | 0.621 |
| 6 | 0.564 |

Sol. Calculation of NPV

Project I

| Years | Inflows | P.V. Factor at 10% | P.V. of Inflows |
|-------|---------|--------------------|-----------------|
| 1 | 48,000 | 0.909 | 43,632 |
| 2 | 32,000 | 0.826 | 26,432 |
| 3 | 20,000 | 0.751 | 15,020 |
| 4 | Nil | 0.683 | Nil |
| 5 | 24,000 | 0.621 | 14,904 |
| 6 | 12,000 | 0.564 | 6,768 |
| | | | 1,06,756 |

$$\text{NPV} = 1,06,756 - 1,00,000 = ₹ 6,756$$

Project II

| Years | Inflows | P.V. Factor at 10% | P.V. of Inflows |
|-------|---------|--------------------|-----------------|
| 1 | 20,000 | 0.909 | 18,180 |
| 2 | 24,000 | 0.826 | 19,824 |
| 3 | 36,000 | 0.751 | 27,036 |
| 4 | 48,000 | 0.683 | 32,784 |
| 5 | 16,000 | 0.621 | 9,936 |
| 6 | 8,000 | 0.564 | 4,512 |
| | | | 1,12,272 |

$$\text{NPV} = 1,12,272 - 1,00,000 = ₹ 12,272$$

Project II should be accepted.

23. Which of the two projects, mentioned below, deserves to be chosen, in preference to the other:

| | Project A | Project B |
|---------------------------|-----------|------------|
| Initial Outlay | ₹ 60,000 | ₹ 1,20,000 |
| Cash inflows after taxes: | | |
| Year-end 1 | 48,000 | 48,000 |
| 2 | 42,000 | 54,000 |
| 3 | — | 42,000 |
| 4 | — | 36,000 |
| Service Life | 2 Years | 4 Years |

Required rate of return is 10%. The P.V. factors for 10% rate are as under:

| Year: | 0 | 1 | 2 | 3 | 4 |
|--------------|-------|-------|-------|-------|-------|
| P.V. Factor: | 1.000 | 0.909 | 0.826 | 0.751 | 0.683 |

Sol. Calculation of Profitability Index

Project A

Initial Outlay = ₹ 60,000

| Years | Inflows | P.V. Factor | P.V. of Inflows |
|-------|---------|-------------|-----------------|
| 1 | 48,000 | 0.909 | 43,632 |
| 2 | 42,000 | 0.826 | 34,692 |
| | | | 78,324 |

$$\begin{aligned} \text{Profitability Index} &= \frac{\text{P.V. of Inflows}}{\text{P.V. of Outflows}} \\ &= \frac{78,324}{60,000} \times 100 = 130.54\% \end{aligned}$$

Project B

| Years | Inflows | P.V. Factor @ 10% | P.V. of Inflows |
|-------|---------|-------------------|-----------------|
| 1 | 48,000 | 0.909 | 43,632 |
| 2 | 54,000 | 0.826 | 44,604 |
| 3 | 42,000 | 0.751 | 31,542 |
| 4 | 36,000 | 0.683 | 24,588 |
| | | | 1,44,366 |

$$\text{Profitability Index} = \frac{1,44,366}{1,20,000} \times 100 = 120.31\%$$

Project A, Because profitability Index is more as compared to project B.

24. A company is considering the following investment projects:

Cash Flow (₹)

| Projects | C ₀ | C ₁ | C ₂ | C ₃ |
|----------|----------------|----------------|----------------|----------------|
| 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 |

Rank the above projects according to (a) Payback method, (b) ARR method, and (c) NPV method, presuming a discount rate of 10% and present values of ₹ 1 at this rate being 0.909, 0.826 and 0.751 for the years 1,2 and 3 respectively.

Sol. (a) Pay-Back Period

Project A

Outflow = ₹ 10,000

Inflow = ₹ 10,000

Payback Period = 1 year

Project B

Outflow = ₹ 10,000

Inflow

Year Inflow

1 7,500

2 7,500

Payback Period = 1 year + $\frac{2,500}{7,500} = 1\frac{1}{3}$ years

Project C

Outflow = ₹ 10,000

Inflow

Year Inflow

1 2,000

2 4,000

3 12,000

Payback Period = 2 years + $\frac{4,000}{12,000} = 2\frac{1}{3}$ years

Project D

Outflow = ₹ 10,000

Inflow

| Year | Inflow |
|------|--------|
| 1 | 10,000 |
| 2 | 3,000 |
| 3 | 3,000 |

Payback Period = 1 year

Project A and D should be selected.

(b) Accounting Rate of Return Method**Project A**

$$\text{ARR} = \frac{\text{Average Profits}}{\text{Average Investment}} = \frac{0}{5,000} = 0\%$$

$$\text{Average Profit} = \frac{10,000 - 10,000}{1} = 0 \text{ (depreciation)}$$

$$\text{Average Investment} = \frac{10,000}{2} = 5,000$$

Project B

$$\text{ARR} = \frac{\text{Average Profits}}{\text{Average Investment}} = \frac{2,500}{5,000} \times 100 = 50\%$$

$$\text{Average Profits} = \frac{7,500 + 7,500 - 10,000}{2} = 2,500$$

Project C

$$\text{ARR} = \frac{\text{Average Profits}}{\text{Average Investment}} = \frac{2,667}{5,000} \times 100 = 53\%$$

$$\begin{aligned} \text{Average Profits} &= \frac{2,000 + 4,000 + 12,000 - 10,000}{3} = 0 \text{ (depreciation)} \\ &= \frac{8,000}{3} = ₹2,667 \end{aligned}$$

Project D

$$\text{ARR} = \frac{\text{Average Profits}}{\text{Average Investment}} = \frac{2,000}{5,000} \times 100 = 40\%$$

$$\begin{aligned} \text{Average Profits} &= \frac{10,000 + 3,000 + 3,000 - 10,000}{3} = 0 \text{ (depreciation)} \\ &= \frac{6,000}{3} = ₹2,000 \end{aligned}$$

Project C should be selected.

(C) Calculation of NPV**Project A**

| Inflows | Period | P.V. of ₹ 1@ 10% | P.V. of Inflows |
|---------|--------|------------------|-----------------|
| 10,000 | 1 | 0.909 | 9,090 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 9,090 - 10,000 = (-)910 \end{aligned}$$

Project B

| Inflows | Period | P.V. of ₹ 1@ 10% | P.V. of Inflows |
|---------|--------|------------------|-----------------|
| 7,500 | 1 | 0.909 | 6,817.5 |
| 7,500 | 2 | 0.826 | 6,195 |
| | | | 13,012.5 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 13,012.5 - 10,000 \\ &= ₹ 3012.5 \end{aligned}$$

Project C

| Year | Inflows | P.V. of ₹ 1@ 10% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 2,000 | 0.909 | 1,818 |
| 2 | 4,000 | 0.826 | 3,304 |
| 3 | 12,000 | 0.751 | 9,012 |
| | | | 14,134 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 14,134 - 10,000 \\ &= ₹ 4,134 \end{aligned}$$

Project D

| Year | Inflows | P.V. of ₹ 1@ 10% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 10,000 | 0.909 | 9,090 |
| 2 | 3,000 | 0.826 | 2,478 |
| 3 | 3,000 | 0.751 | 2,253 |
| | | | 13,821 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 13,821 - 10,000 \\ &= ₹ 3,821 \end{aligned}$$

25. A Company is considering the possibility of manufacturing a particular component which at present is being bought from outside. The manufacture of the component would call for an investment of ₹7,50,000 in a new machine besides an additional investment of ₹50,000 in working capital. The life of the machine would be 10 years with a salvage value of ₹50,000. The estimated savings (before tax) would be ₹1,80,000 p.a. The income-tax rate is 50%. The company's required rate of return is 10%. Depreciation is considered on Straight Line System.

Should the company make this investment? Workings should form part of your answer:

Note: The present value of ₹1 at 10% discount rate is as follows:

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| P.V. | .91 | .83 | .75 | .68 | .62 | .56 | .51 | .47 | .42 | .39 |

The present value (at 10% discount rate) of an annuity of ₹1 payable each year for different years is as follows:

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|------|------|------|------|------|------|------|------|------|------|
| P.V. | 0.91 | 1.74 | 2.49 | 3.17 | 3.79 | 4.35 | 4.87 | 5.33 | 5.75 | 6.14 |

Ignore impact of Income-tax for the system of depreciation followed.

Sol. Outflows

| Year | Outflows | P.V. @ 10% | P.V. of Outflows |
|------|----------|------------|------------------|
| 0 | 7,50,000 | 1 | 7,50,000 |
| 0 | 50,000 | 1 | 50,000 |
| | | | 8,00,000 |

Inflows

| Year | Inflows | P.V. @ 10% | P.V. of Inflows |
|-------|--------------------------|------------|-----------------|
| (1-9) | 1,60,000 | 5.75 | 9,20,000 |
| 10 | (1,60,000+50,000)+50,000 | .39 | 1,01,400 |
| | | | 10,21,400 |

Calculation of Inflows

Profit before Tax = 1,80,000

Less: Tax @ 50% = 90,000

Profit after Tax = 90,000

Add: Depreciation = 70,000

$$\left(\frac{7,50,000 - 50,000}{10} \right) = \underline{1,60,000}$$

NPV = P.V. of Inflows – P.V. of Outflows
 = 10,21,400 – 8,00,000
 = ₹ 2,21,400

26. M/s M Traders wants to install a machinery to produce an article, the demand of which is expected to last for 5 years. The total capital required is as under:

| | |
|---------------------|-----------|
| Plant and Machinery | ₹1,35,250 |
| Working Capital | 20,000 |
| Total | 1,55,250 |

The working capital will be fully realised at the end of 2013. The scrap value of the plant expected to be realised at the end of 2013 is only ₹2,750.

The earnings of M/s M Traders are expected as follows:

| Years | Cash Profit (before depreciation and tax) (₹) | Tax Payable (₹) |
|-------|---|--------------------|
| 2009 | 45,000 | 10,000 |
| 2010 | 65,000 | 15,000 |
| 2011 | 85,000 | 20,000 |
| 2012 | 58,000 | 13,000 |
| 2013 | 29,750 | 2,500 |

Present value factors at 15% rate of interest for 5 years are: 0.8696; 0.7561; 0.6575; 0.5718; and 0.4972. You are required to ascertain whether the plant and machinery should be installed.

Sol. Outflows

| Year | Outflows | P.V. @ 15% of ₹ 1 | P.V. of Inflows |
|------|----------|-------------------|-----------------|
| 0 | 1,35,250 | 1 | 1,35,250 |
| 0 | 20,000 | 1 | 20,000 |
| | | | 1,55,250 |

Inflows

| Years | Inflows (after tax before depreciation) | P.V. @ 15% of ₹ 1 | P.V. of Inflows |
|-------|---|-------------------|-----------------|
| 1 | 35,000 | 0.8696 | 30,436 |
| 2 | 50,000 | 0.7561 | 37,805 |
| 3 | 65,000 | 0.6575 | 42,737.5 |
| 4 | 45,000 | 0.5718 | 25,731 |
| 5 | (27,250+20,000 + 2,750) | 0.4972 | 24,860 |
| | | | 1,61,569.5 |

$$\begin{aligned}
 \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\
 &= 1,61,569.5 - 1,55,250 \\
 &= ₹ 6,319.50
 \end{aligned}$$

Hence, project should be accepted.

27. A limited company is considering investing in a project requiring a capital expenditure of ₹1,00,000. Forecast for annual income after depreciation but before tax is as follows:

| Years | (₹) |
|-------|--------|
| 1 | 50,000 |
| 2 | 50,000 |
| 3 | 40,000 |
| 4 | 40,000 |
| 5 | 20,000 |

Depreciation may be taken as 20% on original cost and taxation at 50% of net income. You are required to evaluate the project according to each of the following methods:

- (a) Payback method.
- (b) Rate of return on original investment and an average investment method.
- (c) Discounted cash flow method taking cost of capital as 10%.
- (d) Profitability index method.

Sol.

| Years | Profit after Depreciation before Tax | | Less Tax | | Profit after Tax | | Depreciation | | Profit after Tax | |
|-------|--------------------------------------|---|----------|---|------------------|---|--------------|---|------------------|--|
| 1 | 50,000 | - | 25,000 | = | 25,000 | + | 20,000 | = | 45,000 | |
| 2 | 50,000 | - | 25,000 | = | 25,000 | + | 20,000 | = | 45,000 | |
| 3 | 40,000 | - | 20,000 | = | 20,000 | + | 20,000 | = | 40,000 | |
| 4 | 40,000 | - | 20,000 | = | 20,000 | + | 20,000 | = | 40,000 | |
| 5 | 20,000 | - | 10,000 | = | 10,000 | + | 20,000 | = | 30,000 | |
| | | | | | 1,00,000 | | | | | |

$$\begin{aligned} \text{Depreciation} &= 20\% \text{ of } 1,00,000 \\ &= ₹ 20,000 \end{aligned}$$

(a) Payback Period

$$2 \text{ years} + \frac{10,000}{40,000} = 2.25 \text{ years}$$

(b) Rate of Return

$$\text{Rate of Return on original Investment} = \frac{\text{Average Profits}}{\text{Investment}} = \frac{20,000}{1,00,000} \times 100 = 20\%$$

$$\text{Average Profits} = \frac{1,00,000}{5} = ₹ 20,000$$

$$\text{Rate of Return on Average Investment} = \frac{20,000}{50,000} \times 100 = 40\%$$

$$\text{Average Investment} = \frac{1,00,000}{2} = 50,000$$

(c) NPV

| Year | Inflows | P.V. of ₹ 1@ 10% | P.V. of Inflows |
|------|---------|------------------|-----------------|
| 1 | 45,000 | 0.909 | 40,905 |
| 2 | 45,000 | 0.826 | 37,170 |
| 3 | 40,000 | 0.751 | 30,040 |
| 4 | 40,000 | 0.683 | 27,320 |
| 5 | 30,000 | 0.621 | 18,630 |
| | | | 1,54,065 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 1,54,065 - 1,00,000 = ₹ 54,065 \end{aligned}$$

(d) Profitability Index

$$= \frac{\text{P.V. of Inflows}}{\text{P.V. of Outflows}} \times 100 = \frac{1,54,065}{1,00,000} \times 100 = 154\%$$

28. You are given the following informations on two mutually exclusive projects X and Y, where cost of capital is 10%.

| Years | Project X (₹) | Project Y (₹) |
|-----------------|---------------|---------------|
| 0 | 43,500 | 36,000 |
| 1 | 10,000 | 15,000 |
| 2 | 12,000 | 13,000 |
| 3 | 13,000 | 12,000 |
| 4 | 14,000 | 10,000 |
| 5 | 16,000 | 10,000 |
| Total Cash Flow | 65,000 | 60,000 |

Compute for both the Project:

(i) NPV at 10% Discount rate

(ii) PI at 10% Discount rate

(iii) IRR

PVF at 10% is shown alongside:

| Years | Value |
|-------|-------|
| 1 | 0.909 |
| 2 | 0.826 |
| 3 | 0.751 |
| 4 | 0.683 |
| 5 | 0.621 |

Sol. Project X

| Years | Inflows | P.V. of @ 10% | P.V. of Inflows |
|-------|---------|---------------|-----------------|
| 1 | 10,000 | 0.909 | 9,090 |
| 2 | 12,000 | 0.826 | 9,912 |
| 3 | 13,000 | 0.751 | 9,763 |
| 4 | 14,000 | 0.683 | 9,562 |
| 5 | 16,000 | 0.621 | 9,936 |
| | | | 48,263 |

$$\begin{aligned}
 \text{(i) NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\
 &= 48,263 - 43,500 \\
 &= ₹ 4,763
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Profitability Index} &= \frac{\text{P.V. of Inflows}}{\text{P.V. of Outflows}} \\
 &= \frac{48,263}{43,500} = 1.109
 \end{aligned}$$

(iii) Internal Rate of Return

| Year | Inflows | P.V. @ 15% | P.V. of Inflows |
|------|---------|------------|-----------------|
| 1 | 10,000 | 0.870 | 8,700 |
| 2 | 12,000 | 0.756 | 9,072 |
| 3 | 13,000 | 0.658 | 8,554 |
| 4 | 14,000 | 0.572 | 8,008 |
| 5 | 16,000 | 0.497 | 7,952 |
| | | | 42,286 |

$$\text{IRR} = 10\% + \frac{4,763}{4,763 + 1,214} \times 5\% = 14\%$$

Project Y

| Year | Inflows | P.V. @ 10 % | P.V. of Inflows |
|------|---------|-------------|-----------------|
| 1 | 15,000 | 0.909 | 13,635 |
| 2 | 13,000 | 0.826 | 10,738 |
| 3 | 12,000 | 0.751 | 9,012 |
| 4 | 10,000 | 0.683 | 6,830 |
| 5 | 10,000 | 0.621 | 6,210 |
| | | | 46,425 |

$$\begin{aligned}
 \text{(i) NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\
 &= 46,425 - 36,000 \\
 &= ₹ 10,425
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) Profitability Index} &= \frac{\text{P.V. of Inflows}}{\text{P.V. of Outflows}} \\
 &= \frac{46425}{36,000} = 1.29
 \end{aligned}$$

(iii) Internal Rate of Return

| Year | Inflows | P.V. of 20% | P.V. of Inflow @22% | P.V. factor @ 20% | P.V. factor @ 22% |
|------|---------|-------------|---------------------|-------------------|-------------------|
| 1 | 15,000 | 12,495 | 12,300 | 0.833 | 0.820 |
| 2 | 13,000 | 9,022 | 8,736 | 0.694 | 0.672 |
| 3 | 12,000 | 6,948 | 6,612 | 0.579 | 0.551 |
| 4 | 10,000 | 4,820 | 4,510 | 0.482 | 0.451 |
| 5 | 10,000 | 4,020 | 3,700 | 0.402 | 0.370 |
| | | 37,305 | 35,858 | | |

$$\text{IRR} = 20\% + \frac{1,305}{1,305 + 142} \times 2\% = 21.8\%$$

29. The Abram Co. Ltd. is considering the purchase of a new machine. Two alternative machines (A and B) have been suggested, each having an initial cost of ₹4,00,000 and requiring ₹20,000 as additional working capital at the end of first year. Earning after taxation are expected to be as follows:

| Years | Cash Inflows | |
|-------|---------------|---------------|
| | Machine A (₹) | Machine B (₹) |
| 1 | 40,000 | 1,20,000 |
| 2 | 1,20,000 | 1,60,000 |
| 3 | 1,60,000 | 2,00,000 |
| 4 | 2,40,000 | 1,20,000 |
| 5 | 1,60,000 | 80,000 |

The company has a target of return on capital of 10% and on this basis, you are required to compare the profitability of the machines and state which alternative you consider financial preferable.

Note: The following table gives the present value of ₹1 due in 'n' number of years:

| Years | Present Value at 10% |
|-------|----------------------|
| 1 | 0.91 |
| 2 | 0.83 |
| 3 | 0.75 |
| 4 | 0.68 |
| 5 | 0.62 |

Sol. Machine A

Calculation of Present Value of Outflows

| Year | Outflows | P.V. @ 10% | P.V. of Outflows |
|------|----------|------------|------------------|
| 0 | 4,00,000 | 1 | 4,00,000 |
| 1 | 20,000 | 0.91 | 18,200 |
| | | | 4,18,200 |

Calculation of Present Value of Inflows

| Year | Inflows after Tax before Depreciation | P.V. @10% | P.V. of Inflows |
|------|---|-----------|-----------------|
| 1 | 40,000 + 80,000 = 1,20,000 | 0.91 | 1,09,200 |
| 2 | 1,20,000 + 80,000 = 2,00,000 | 0.83 | 1,66,000 |
| 3 | 1,60,000 + 80,000 = 2,40,000 | 0.75 | 1,80,000 |
| 4 | 2,40,000 + 80,000 = 3,20,000 | 0.68 | 2,17,600 |
| 5 | (1,60,000 + 20,000) + 80,000 = 2,60,000 | 0.62 | 1,61,200 |
| | | | 8,34,000 |

$$\begin{aligned}
 \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\
 &= 8,34,000 - 4,18,200 \\
 &= ₹ 4,15,800
 \end{aligned}$$

Machine B

Calculation of Present Value of Inflows

| Year | Inflows after Tax before Depreciation | P.V. @10% | P.V. of Inflows |
|------|---------------------------------------|-----------|-----------------|
| 1 | 1,20,000 + 80,000 = 2,00,000 | 0.91 | 1,82,000 |
| 2 | 1,60,000 + 80,000 = 2,40,000 | 0.83 | 1,99,200 |
| 3 | 2,00,000 + 80,000 = 2,80,000 | 0.75 | 2,10,000 |
| 4 | 1,20,000 + 80,000 = 2,00,000 | 0.68 | 1,36,000 |
| 5 | (80,000 + 20,000) + 80,000 = 1,80,000 | 0.62 | 1,11,600 |
| | | | 8,38,800 |

Present value of outflow is same as in (i)

$$\begin{aligned}
 \text{NPV} &= \text{P.V. of Inflow} - \text{P.V. of Outflows} \\
 &= 8,38,800 - 4,18,200 \\
 &= ₹ 4,20,600
 \end{aligned}$$

30. The Philips Corporation which has a 50% tax rate and a 10% after tax cost of capital is evaluating a project which will cost ₹ 1,00,000 and will require an increase in the level of inventories and receivables of ₹ 50,000 over its effective Life. The project will generate additional sales of ₹ 1,00,000 and will require cash expenses of ₹ 30,000 in each year of its 5-year life. It will be depreciated on a straight line basis. What are the net present value and internal rate of return for the project?

Sol. Calculation of Present Value of Outflows

| Year | Outflows | P.V. @ 10% | P.V. of Outflows |
|------|----------|------------|------------------|
| 0 | 1,00,000 | 1 | 1,00,000 |
| 0 | 50,000 | 1 | 50,000 |
| | | | 1,50,000 |

Calculation of Present Value of Inflows

| | |
|--------------------------------------|---------------|
| Sales | 1,00,000 |
| Less: Cash Expenses | 30,000 |
| Depreciation (1,00,000/5) | <u>20,000</u> |
| Profit before Tax | 50,000 |
| Less: Tax @50% | <u>25,000</u> |
| Profit after Tax | 25,000 |
| Add: depreciation | <u>20,000</u> |
| Profit after tax before depreciation | <u>45,000</u> |

| Year | Inflows | P.V. @ 10% | P.V. of Inflows |
|-------|-------------------|------------|-----------------|
| (1-4) | 45,000 | 3.170 | 1,42,650 |
| 5 | (45,000 + 50,000) | 0.621 | 58,995 |
| | | | 2,01,645 |

$$\begin{aligned}
 \text{NPV} &= \text{P.V. of Inflow} - \text{P.V. of Outflows} \\
 &= 2,01,645 - 1,50,000 \\
 &= ₹ 51,645
 \end{aligned}$$

Calculation of Internal Rate of Return

| Year | Inflows | P.V. @ 20% | P.V. of Inflows | P.V. @ 22% | P.V. of Inflows |
|-------|-------------------|------------|-----------------|------------|-----------------|
| (1-4) | 45,000 | 2.588 | 1,16,460 | 2.494 | 1,12,230 |
| 5 | (45,000 + 50,000) | 0.402 | 38,190 | 0.370 | 35,150 |
| | | | 1,54,650 | | 1,47,380 |

$$\text{IRR} = 20\% + \frac{4,650}{4,650 + 2,620} \times 2\% = 21.27\%$$

31. The management of a company has two alternative projects under consideration project A requires a capital outlay of ₹2,40,000 but project B needs ₹3,60,000. Both are estimated to provide a cash flow for 5 years: A ₹80,000 per year and B ₹1,16,000 per year. The cost of capital is 10% show which of the projects is preferable from the viewpoint of (i) NPV and (ii) IRR.

Sol. Project A

Outflow

| Year | Outflow | P.V. @ 10% | P.V. of Outflow |
|------|----------|------------|-----------------|
| 0 | 2,40,000 | 1 | 2,40,000 |
| | | | 2,40,000 |

Inflows

| Years | Inflows | P.V. @ 10% | P.V. of Inflows |
|-------|---------|------------|-----------------|
| (1-5) | 80,000 | 3.79 | 3,03,200 |
| | | | 3,03,200 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 3,03,200 - 2,40,000 = 63,200 \end{aligned}$$

IRR

| Year | Inflows | P.V. @ 15% | P.V. of Inflows | P.V. @ 20% | P.V. of Inflows |
|-------|---------|------------|-----------------|------------|-----------------|
| (1-5) | 80,000 | 3.353 | 2,68,240 | 2.99 | 2,39,200 |

$$\text{IRR} = 15\% + \frac{28,240}{28,240 + 800} \times 5\% = 19.8\%$$

Project B

Outflow

| Year | Outflow | P.V. @ 10% | P.V. of Outflow |
|------|----------|------------|-----------------|
| 0 | 3,60,000 | 1 | 3,60,000 |
| | | | 3,60,000 |

Inflows

| Year | Inflows | P.V. @ 10% | P.V. of Inflows |
|-------|----------|------------|-----------------|
| (1-5) | 1,16,000 | 3.79 | 4,39,640 |
| | | | 4,39,640 |

$$\begin{aligned} \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\ &= 4,39,640 - 3,60,000 = 79,640 \end{aligned}$$

IRR

| Year | Inflows | P.V. @ 15% | P.V. of Inflows | P.V. @ 20% | P.V. of Inflows |
|-------|----------|------------|-----------------|------------|-----------------|
| (1-5) | 1,16,000 | 3.353 | 3,88,948 | 2.99 | 3,46,840 |

$$\text{IRR} = 15\% + \frac{28,948}{28,948 + 13,160} \times 5\% = 18.44\%$$

(i) Project B should be selected.

(ii) Project A should be selected.

32. A choice is to be made between two competing projects which require an investments of ₹43,500 for project 'X' and ₹36,000 for project 'Y' and are expected to generate net cash inflows as under:

| Years | Project 'X' (₹) | Project 'Y' (₹) |
|-------|-----------------|-----------------|
| 1 | 10,000 | 14,000 |
| 2 | 12,000 | 13,000 |
| 3 | 13,000 | 12,000 |
| 4 | 14,000 | 11,000 |
| 5 | 16,000 | 10,000 |
| | 65,000 | 60,000 |

The cost of capital is 10%. Using the Internal Rate of Return method, recommend which project is to be preferred. Use the following discount factor table and annuity table to solve the question:

Discount Factor Table

| Years | 5% | 10% | 15% | 20% | 25% | 30% |
|-------|------|------|------|------|------|------|
| 1 | .952 | .909 | .870 | .833 | .800 | .769 |
| 2 | .907 | .826 | .756 | .694 | .640 | .592 |
| 3 | .864 | .751 | .658 | .579 | .512 | .455 |
| 4 | .823 | .683 | .572 | .482 | .410 | .350 |
| 5 | .784 | .621 | .497 | .402 | .328 | .269 |

Annuity Table

| Year | 5% | 10% | 15% | 20% | 25% | 30% |
|------|-------|-------|-------|-------|-------|-------|
| 5 | 4.329 | 3.791 | 3.352 | 2.991 | 2.689 | 2.436 |

Calculation of IRR**Project X**

| Year | Inflows | P.V. @10% | P.V. of Inflows | P.V. @ 15% | P.V. of Inflows |
|------|---------|-----------|-----------------|------------|-----------------|
| 1 | 10,000 | 0.909 | 9,090 | 0.870 | 8,700 |
| 2 | 12,000 | 0.826 | 9,912 | 0.756 | 9,072 |
| 3 | 13,000 | 0.751 | 12,016 | 0.658 | 8,554 |
| 4 | 14,000 | 0.683 | 9,562 | 0.572 | 8,008 |
| 5 | 16,000 | 0.621 | 9,936 | 0.497 | 7,952 |
| | | | 50,516 | | 42,286 |

$$10\% + \frac{7,016}{7,016 + 1,214} \times 5\% = 14.26\%$$

Project Y

| Year | Inflows | P.V. @ 20% | P.V. of Inflows | P.V. @ 25% | P.V. of Inflows |
|------|---------|------------|-----------------|------------|-----------------|
| 1 | 14,000 | 0.833 | 11,662 | 0.8 | 11,200 |
| 2 | 13,000 | 0.694 | 9,022 | 0.640 | 8,320 |
| 3 | 12,000 | 0.579 | 6,948 | 0.512 | 6,144 |
| 4 | 11,000 | 0.482 | 5,302 | 0.410 | 4,510 |
| 5 | 10,000 | 0.402 | 4,020 | 0.328 | 3,280 |
| | | | 36,954 | | 33,454 |

$$20\% + \frac{954}{954 + 2,546} \times 5\% = 21.36\%$$

Project Y should be accepted.

33. A company intends to install a machine costing ₹50,000 with life of 5 years, and no salvage value. Rate of tax is 35%. Company using fixed instalment method of depreciation and the estimated cash flow before depreciation and tax from the machine are as follows:

| Years | Cash Flow |
|-------|-----------|
| 1 | 10,000 |
| 2 | 10,692 |
| 3 | 13,769 |
| 4 | 13,462 |
| 5 | 20,385 |

Using appropriate, appraisal methods, advise the company accordingly, if the discounting rate is 10%.

PVF at 10% discount rates are 0.909, 0.826, 0.751, 0.683 and 0.621, for the years one to five respectively.

Sol.

| Years | Cash Flow before Depreciation | Less Depreciation | | Profit before Tax | | Tax | | Profit after Tax |
|-------|-------------------------------|-------------------|---|-------------------|---|-------|---|------------------|
| 1 | 10,000 | 10,000 | = | Nil | - | Nil | = | Nil |
| 2 | 10,692 | 10,000 | = | 692 | - | 242 | = | 450 |
| 3 | 13,769 | 10,000 | = | 3,769 | - | 1,319 | = | 2,450 |
| 4 | 13,462 | 10,000 | = | 3,462 | - | 1,212 | = | 2,250 |
| 5 | 20,385 | 10,000 | = | 10,385 | - | 3,635 | = | 6,750 |

| Year | Profit after Tax before Dep. | P.V. @10% | P.V. of Inflows |
|------|------------------------------|-----------|-----------------|
| 1 | 10,000 | 0.909 | 9,090 |
| 2 | 10,450 | 0.826 | 8,632 |
| 3 | 12,450 | 0.751 | 9,350 |
| 4 | 12,250 | 0.683 | 8,367 |
| 5 | 16,750 | 0.621 | 10,402 |
| | | | 45,841 |

$$\begin{aligned}
 \text{NPV} &= \text{P.V. of Inflows} - \text{P.V. of Outflows} \\
 &= 45,841 - 50,000 \\
 &= (-) 4159
 \end{aligned}$$

A company should reject the project.



4

Cost of Capital

■ Numerical Questions

● Cost of Debt

5. A company has issued 10% debentures of ₹5,00,000. The company is in tax bracket of 35. Calculate the before tax and after tax cost of debenture if the debentures are issued:
- (a) at par, (b) at a discount of 10%, (c) at a discount of 15%, (d) at a premium of 10%, and (e) at a premium of 15%

Sol. (a) at par

Before Tax

$$\begin{aligned}K_d &= \frac{I}{NP} \times 100 \\ &= \frac{50,000}{5,00,000} \times 100 \\ &= 10\%\end{aligned}$$

After Tax

$$\begin{aligned}K_d &= \frac{I(1-t)}{NP} \times 100 \\ &= \frac{50,000(1-.35)}{5,00,000} \times 100 \\ &= 6.5\%\end{aligned}$$

(b) at a discount of 10%

Before Tax

$$\begin{aligned}K_d &= \frac{50,000}{4,50,000} \times 100 & NP &= 5,00,000 - 10\% \text{ of } 5,00,000 = 4,50,000 \\ &= 11.11\%\end{aligned}$$

After Tax

$$\begin{aligned}K_d &= \frac{50,000(1-.35)}{4,50,000} \times 100 \\ &= 7.2\%\end{aligned}$$

(c) at a discount of 15%

Before Tax

$$K_d = \frac{50,000}{4,25,000} \times 100$$

$$= 11.76\%$$

$$NP = 5,00,000 - 15\% \text{ of } 5,00,000 = 4,25,000$$

After Tax

$$K_d = \frac{50,000(1 - .35)}{4,25,000} \times 100$$

$$= 7.65\%$$

(d) at a premium of 10%

Before Tax

$$K_d = \frac{50,000}{5,50,000} \times 100$$

$$= 9.09\%$$

$$NP = 5,00,000 + 10\% \text{ of } 5,00,000 = 5,50,000$$

After Tax

$$K_d = \frac{50,000(1 - .35)}{5,50,000} \times 100$$

$$= 5.91\%$$

(e) at a premium of 15%

Before Tax

$$K_d = \frac{50,000}{5,75,000} \times 100$$

$$= 8.70\%$$

$$NP = 5,00,000 + 15\% \text{ of } 5,00,000 = 5,75,000$$

After Tax

$$K_d = \frac{50,000(1 - .35)}{5,75,000} \times 100$$

$$= 5.65\%$$

6. A company has issued debentures having face value of ₹100 at the rate of 10%. The company is in the tax bracket of 35%. The debentures are to be redeemed after 5 years at a premium of 15%. The flotation cost involved in the issue of debentures is 5%. Find the cost of debentures.

Sol.

$$K_d = \frac{I(1-t) + \frac{(RV - NP)}{N}}{\frac{NP + RV}{2}} \times 100$$

$$\text{Note: } \left[\begin{array}{l} RV = 100 + 15\% \text{ of } 100 = 115 \\ NP = 100 - 5\% \text{ of } 100 = 95 \end{array} \right]$$

$$= \frac{10(1 - .35) + \frac{(115 - 95)}{5}}{\frac{115 + 95}{2}} \times 100$$

$$= \frac{6.5 + 4}{105} \times 100$$

$$= 10\%$$

7. A company has issued 12% debentures of face value of ₹100 each. The company is in tax bracket of 35%. The debentures are to be redeemed after 5 years at a premium of 15%. The flotation cost involved in the issue of debentures is 10%. What is the cost of debentures?

Sol.

$$K_d = \frac{I(1-t) + \frac{(RV - NP)}{N}}{\frac{NP + RV}{2}} \times 100$$

Note: $\left[\begin{array}{l} \therefore RV = 100 + 15\% \text{ of } 100 = 115 \\ NP = 100 - 10\% \text{ of } 100 = 90 \end{array} \right]$

$$= \frac{12(1 - .35) + \frac{(115 - 90)}{5}}{\frac{90 + 115}{2}} \times 100$$

$$= \frac{7.8 + 5}{102.5} \times 100$$

$$= 12.49\%$$

8. A company has issued debentures having face value of ₹100 at the rate of 10%. The company is in tax bracket of 35%. The debentures are to be redeemed after 5 years at a discount of 10%. The flotation cost involved in the issue of debentures is 5%. Find the cost of debentures.

Sol.

$$(a) K_d = \frac{I(1-t) + \frac{(RV - NP)}{N}}{\frac{NP + RV}{2}} \times 100$$

Note: $\left[\begin{array}{l} RV = 100 - 10\% \text{ of } 100 = 90 \\ NP = 100 - 5\% \text{ of } 100 = 95 \end{array} \right]$

$$= \frac{10(1 - .35) + \frac{90 - 95}{5}}{\frac{95 + 90}{2}} \times 100$$

$$= \frac{6.5 - 1}{92.5} \times 100$$

$$= 5.9\%$$

● **Cost of Preference Share Capital**

9. A company issued 10% irredeemable preference shares of the face value of ₹100 each. Find out the cost of preference share capital in each of the following cases:

(a) issued at 10% discount (b) issued at 10% premium

Sol. (a) Issued at 10% discount

$$= K_p = \frac{P_D}{P_0} \times 100 \qquad P_0 = 100 - 10\% \text{ of } 100 = 90$$

$$= \frac{10}{90} \times 100$$

$$= 11.11\%$$

(b) Issued at 10% premium

$$K_p = \frac{10}{110} \times 100$$

$$= 9.09\%$$

10. A company issued 10,000, 8% preference shares of ₹200 each. Cost of issue is ₹20,000. Calculate the cost of preference share capital if these shares are issued (i) at par, (ii) at a premium of 5%, and (iii) at a discount of 5%.

Sol. (i) Issued at par

$$K_p = \frac{P_D}{P_0} \times 100$$

$$= \frac{1,60,000}{19,80,000} \times 100$$

$$= 8.08\%$$

$$\left[\begin{array}{l} P_D = 10,000 \times 200 \\ = 20,00,000 \times 8\% \\ = 1,60,000 \\ P_0 = 20,00,000 - 20,000 \\ = 19,80,000 \end{array} \right]$$

(ii) at a premium of 5%

$$K_p = \frac{1,60,000}{20,80,000} \times 100$$

$$= 7.69\%$$

$$\left[\begin{array}{l} P_0 = 20,00,000 + 5\% \text{ of } 20,00,000 \\ = 20,000 \\ = 20,80,000 \end{array} \right]$$

(iii) at a discount of 5%

$$K_p = \frac{1,60,000}{18,80,000} \times 100$$

$$= 8.51\%$$

$$\left[\begin{array}{l} P_0 = 20,00,000 - 5\% \text{ of } 20,00,000 \\ - 20,000 \\ = 18,80,000 \end{array} \right]$$

11. Jacob Ltd. issued 8,000, 10% irredeemable preference shares of ₹500 each at ₹475. Issue expenses are 5% of issue price. Calculate the cost of preference capital

Sol.

$$K_p = \frac{P_D}{P_0} \times 100$$

$$= \frac{4,00,000}{36,10,000} \times 100$$

$$= 11.08\%$$

$$\left[\begin{array}{l} P_D = 8,000 \times 500 \\ = 40,00,000 \times 10\% \\ = 4,00,000 \\ P_0 = 8,000 \times 475 - 5\% \text{ of } 38,00,000 \\ = 38,00,000 - 1,90,000 \\ = 36,10,000 \end{array} \right]$$

- 12.** A company issued 50,000, 9% irredeemable preference shares of ₹200 each. The issue expenses are 5% of issue price. Calculate the cost of preference capital if the shares are issued (i) at 10% discount, and (ii) at 10% premium.

Sol. (i) Issued at 10% discount

$$K_p = \frac{P_D}{P_0} \times 100 \quad \left[\begin{array}{l} P_D = 9\% \text{ of } 50,000 \times 200 \\ = 9,00,000 \end{array} \right]$$

$$= \frac{9,00,000}{85,50,000} \times 100 \quad \left[\begin{array}{l} P_0 = 50,000 \times 180 - 4,50,000\% (90,00,000 \times 5\%) \\ = 85,50,000 \end{array} \right]$$

$$= 10.53\%$$

(ii) at 10% premium

$$K_p = \frac{9,00,000}{10,45,00,000} \times 100 \quad \left[\begin{array}{l} P_0 = 50,000 \times 220 - 5,50,000\% = 1,04,50,000 \\ = 11,00,00,000 \times 5\% \end{array} \right]$$

$$= 8.61\%$$

- 13.** A company issued 1,00,000, 8% irredeemable preference shares of ₹500 each. Issue expenses are 2% of face value. Assuming 10% dividend tax payable by the company, compute the cost of preference capital if the shares are issued:

(i) at par, (ii) at 10% discount, and (iii) at 10% premium.

(**Hint:** $K_p = \frac{P_d(1 + D_t)}{P_0(1 - f)}$ where D_t = tax on preference dividend. Issue expenses are 2% of face value not of issue price.)

Sol. (i) Issued at par

$$K_p = \frac{P_D}{P_0} \times 100 \quad \left[\begin{array}{l} P_D = 8\% \text{ of } 500 \\ = ₹40 \end{array} \right]$$

$$= \frac{44}{490} \times 100 \quad \text{Dividend Tax} = 10\% \text{ of } 40 = 4$$

$$= 8.98\% \quad \text{Total preference dividend} = 40 + 4 = ₹ 44$$

$$\left[\begin{array}{l} P_0 = 500 - 2\% \text{ of } 500 \\ = 490 \end{array} \right]$$

(ii) at 10% discount

$$K_p = \frac{44}{440} \times 100 \quad \left[\begin{array}{l} P_0 = 500 - 10\% \text{ of } 500 - 2\% \text{ of } 500 \\ = 500 - 50 - 10 \\ = 440 \end{array} \right]$$

$$= 10\%$$

(iii) at 10% of premium

$$K_p = \frac{44}{540} \times 100$$

$$= 8.15\%$$

$$\left[\begin{array}{l} P_0 = 500 + 10\% \text{ of } 500 - 10 \\ = 540 \end{array} \right]$$

14. A company issues 8% irredeemable preference shares of ₹500 each. Issue expenses are estimated 2% of issue price. Assuming 10% dividend tax payable by the company, find out the cost of preference capital if the shares are issued at:

(i) at par (ii) at 10% discount, and (iii) at 10% premium.

Sol. (i) Issued at par

$$K_p = \frac{P_D}{P_0} \times 100$$

$$= \frac{44}{490} \times 100$$

$$= 8.98\%$$

$$\left[\begin{array}{l} P_D = 500 \times 8\% = 40 \\ \text{Dividend Tax} = 40 \times 10\% = 4 \\ \text{Total dividend} = 40 + 4 = 44 \end{array} \right]$$

$$\left[\begin{array}{l} P_0 = 500 - 2\% \text{ of } 500 \\ = 500 - 10 \\ = 490 \end{array} \right]$$

(ii) Issued at 10% discount

$$K_p = \frac{44}{441} \times 100$$

$$= 9.98\%$$

$$\left[\begin{array}{l} P_0 = 500 - 10\% \text{ of } 500 \\ = 450 \\ = 450 - 2\% \text{ of } 450 = 450 - 9 \\ = 441 \end{array} \right]$$

(iii) Issued at 10% premium

$$K_p = \frac{44}{539} \times 100$$

$$= 8.16\%$$

$$\left[\begin{array}{l} P_0 = 500 + 10\% \text{ of } 500 \\ = 550 \\ = 550 - 2\% \text{ of } 550 = 550 - 11 \\ = 539 \end{array} \right]$$

15. (a) A company issues 12% preference shares of ₹500 each at ₹450 redeemable after 5 years at par. The cost of flotation is expected to be 5% of issue price. Calculate the cost of preference capital.

(b) A Co. Ltd issues 12% preference shares of ₹500 each at ₹550 each redeemable after 5 years at par. The cost of flotation is expected to be 5% of issue price. Calculate the cost of preference capital.

- (c) A Co. Ltd. issues 12% preference shares of ₹500 each at ₹450 each redeemable after 5 years at ₹520. The cost of flotation is expected to be 5% of issue price. Calculate the cost of preference capital.

Sol.

$$(a) K_p = \frac{P_D + \frac{(P_n - P_0)}{N}}{\left(\frac{P_n + P_0}{2}\right)} \times 100$$

$$= \frac{60 + \frac{(500 - 427.5)}{5}}{\frac{500 + 427.5}{2}} \times 100$$

$$= \frac{60 + 14.5}{463.75} \times 100$$

$$= 16.06\%$$

$$\left[\begin{array}{l} P_D = 500 \times 12\% = 60 \\ P_n = 500 \\ P_0 = 450 - 5\% \text{ of } 450 \\ = 450 - 22.5 = 427.5 \end{array} \right]$$

$$(b) K_p = \frac{60 + \frac{(500 - 522.5)}{5}}{\frac{500 + 522.5}{2}} \times 100$$

$$= \frac{60 - 4.5}{511.25} \times 100$$

$$= 10.86\%$$

$$\left[\begin{array}{l} P_D = 500 \times 12\% = 60 \\ P_n = 500 \\ P_0 = 550 - 5\% \text{ of } 550 \\ = 550 - 27.5 = 522.5 \end{array} \right]$$

$$(c) K_p = \frac{60 + \frac{(520 - 427.5)}{5}}{\frac{520 + 427.5}{2}} \times 100$$

$$= \frac{60 + 18.5}{473.75} \times 100$$

$$= 16.57\%$$

$$\left[\begin{array}{l} P_D = 500 \times 12\% = 60 \\ P_0 = 450 - 5\% \text{ of } 450 \\ = 450 - 22.5 = 427.5 \\ P_n = 520 \end{array} \right]$$

16. (a) XYZ Ltd. issues 5,00,000, 10% preference shares of ₹100 each at a premium of 5% redeemable after 5 years at par. The issue expenses are estimated to be 2% of the issue price. Calculate the cost of preference capital, assuming 10% dividend tax payable by the company.
- (b) A company issues 10,000, 10% preference shares of ₹100 each. Cost of issue is ₹2 per share. Calculate the cost of preference share capital, if these shares are issued (i) at par, (ii) at a premium of 10%, (iii) and at a discount of 5%.
- (c) XYZ Ltd. issues 2,00,000, 8% preference shares of ₹100 each at ₹95 redeemable after 5 years at ₹105. The cost of issue is expected to be 2% of issue price. Calculate the cost of preference capital, assuming 10% dividend tax payable by the company.

(**Hint:** Tax on dividend should be added to the amount of dividend for calculating the cost of capital).

Sol.

$$(a) K_p = \frac{P_D + \frac{(P_n - P_0)}{N}}{\left(\frac{P_n + P_0}{2}\right)} \times 100$$

$$\begin{aligned} &= \frac{11 + \frac{(100 - 102.9)}{5}}{\frac{100 + 102.9}{2}} \times 100 \\ &= \frac{11 - 0.58}{101.45} \times 100 \\ &= 10.27\% \end{aligned}$$

(b) (i) Issued at par

$$\begin{aligned} K_p &= \frac{P_D}{P_0} \times 100 \\ &= \frac{10}{98} \times 100 \\ &= 10.2\% \end{aligned}$$

$$P_D = 100 \times 10\% = 10$$

$$P_0 = 100 - 2 = 98$$

(ii) at a premium of 10%

$$\begin{aligned} K_p &= \frac{10}{108} \times 100 \\ &= 9.26\% \end{aligned}$$

$$P_0 = 110 - 2 = 108$$

(iii) at a discount of 5%

$$\begin{aligned} K_p &= \frac{10}{93} \times 100 \\ &= 10.75\% \end{aligned}$$

$$P_0 = 95 - 2 = 93$$

$$(c) K_p = \frac{P_D + \frac{(P_n - P_0)}{N}}{\left(\frac{P_n + P_0}{2}\right)} \times 100$$

$$\begin{aligned} &= \frac{8.8 + \frac{(105 - 93.1)}{5}}{\frac{105 + 93.1}{2}} \times 100 \end{aligned}$$

$$\left[\begin{array}{l} P_D = 100 \times 10\% = 10 \\ \text{Dividend Tax} = 10\% \text{ of } 10 = 1 \\ \text{Total dividend} = 10 + 1 = 11 \\ P_0 = 100 + 5\% \text{ of } 100 \\ = 100 + 5 = 105 \\ 105 - 2\% \text{ of } 105 = 102.9 \\ P_n = 100 \end{array} \right]$$

$$\left[\begin{array}{l} P_D = 100 \times 8\% = 8 \\ \text{Dividend Tax} = 10\% \text{ of } 8 = 0.8 \\ 8 + 0.8 = 8.8 \\ P_n = 105 \\ P_0 = 95 - 2\% \text{ of } 95 \\ = 95 - 1.9 = 93.1 \end{array} \right]$$

$$= \frac{8.8 - 2.38}{99.05\%} \times 100$$

$$= 11.29\%$$

● Cost of Equity Share Capital

17. The current market price of the shares of Fama Ltd. is ₹95. The flotation costs are ₹5 per share. The expected dividend per share amount to ₹4.50. The expected growth rate is 8%. Calculate the cost of equity share capital.

Sol. (a) $K_e = \frac{D_1}{P_0} \times 100 + g$ $P_0 = 95 - 5 = 90$

$$= \frac{4.5}{90} \times 100 + 8\%$$

$$= 5\% + 8\%$$

$$= 13\%$$

18. The shares of a company are currently being traded at a price of ₹60 and the expected growth rate in dividend payment is 10%. Find the cost of equity capital if the dividend paid last year is:

(a) ₹5 (b) ₹6 (c) ₹8

Sol. $K_e = \frac{D_0(1+g)}{P_0} \times 100 + g$

(a) $K_e = \frac{5(1+10)}{60} \times 100 + 10\%$

$$= 19.17\%$$

(b) $K_e = \frac{6(1+10)}{60} \times 100 + 10\%$

$$= 21\%$$

(c) $K_e = \frac{8(1+10)}{60} \times 100 + 10\%$

$$= 24.67\%$$

19. A company Ltd. declared a dividend of ₹5 per share last year. The company expects growth rate of 5%. Find the cost of equity capital of the company if the current market price of shares is:

(a) ₹30, (b) ₹40, and (c) ₹50

Sol. $K_e = \frac{D_0(1+g)}{P_0} \times 100 + g$

(a) $K_e = \frac{5(1+0.05)}{30} \times 100 + 5\%$

$$= 22.5\%$$

$$(b) K_e = \frac{5(1+0.05)}{40} \times 100 + 5\%$$

$$= 18.13\%$$

$$(c) K_e = \frac{5(1+0.05)}{50} \times 100 + 5\%$$

$$= 15.5\%$$

20. The current market price of equity shares of A Co. Ltd. is ₹40. The company declared dividend per share of ₹2 last year. Find the cost of equity if the growth rate of dividend is:

(a) 5%, (b) 10%, and (c) 12%

Sol. $K_e = \frac{D_0(1+g)}{P_0} \times 100 + g$

$$(a) K_e = \frac{2(1+0.05)}{40} \times 100 + 5\%$$

$$= 10.25\%$$

$$(b) K_e = \frac{2(1+0.10)}{40} \times 100 + 10\%$$

$$= 15.5\%$$

$$(c) K_e = \frac{2(1+0.12)}{40} \times 100 + 12\%$$

$$= 17.60\%$$

21. A Co. Ltd. is thinking to issue new equity shares. The dividend track record of the company for last five years is given below:

Amount (₹)

10

10.5

11.03

11.58

12.16

The flotation cost is likely to be 2% of the selling price. The shares of the company are currently being sold at a price of ₹150 per share. Calculate the following:

(a) growth rate in dividends, (b) cost of existing equity shares, and (c) cost of new equity shares.

(Hint: Flotation cost is deducted in case of new shares.)

Sol. (a) $D_0(1+g) = D_1$
 $10(1+g)^4 = 12.16$
 $(1+g)^4 = \frac{12.16}{10}$
 $(1+g)^4 = 1.216$

Using compound factor tables, we find that ₹1 compounds to 1.216 in 4 years at the compound rate of 5%.

Hence, $g = 5\%$

(b) $K_e = \frac{D_0(1+g)}{P_0} \times 100 + g$
 $= \frac{12.16 (1 + 0.05)}{150} \times 100 + 5\%$
 $= 13.5\%$

(c) $K_e = \frac{D_0(1+g)}{P_0} \times 100 + g$
 $= \frac{12.16 (1 + 0.05)}{147} \times 100 + 5\%$
 $= 13.69\%$

$P_0 = 150 - 2\% \text{ of } 150 = 147$

22. A Ltd. Company has 2,00,000 equity shares of ₹10 each and its current market value is ₹125 each. The after tax profit of the company for the year ended 31st March, 2005 is ₹40,50,000. Calculate the cost of capital based on price/earnings model.

Sol. $K_e = \frac{E}{M} \times 100$
 $= \frac{20.25}{125} \times 100$
 $= 16.20\%$

$E = \frac{40,50,000}{2,00,000}$
 $= 20.25$

23. Risk free interest rate (R_f) = 8%
 Return on market portfolio (R_m) = 20%
 Systematic Risk (β) = 1.5

Calculate the cost of equity as per CAPM.

Sol. $K_e = R_f + \beta(R_m - R_f)$
 $8\% + 1.5 (20\% - 8\%)$
 $= 26\%$

24. Risk free rate of interest (R_f) = 7%
 Return on market portfolio (R_m) = 15%
 Systematic Risk (β) = 0.75

Calculate the cost of equity capital.

Sol. $K_e = R_f + b(R_m - R_f)$
 $7\% + 0.75(15\% - 7\%)$
 $= 13\%$

25. A company has following amount and specific cost of each type of capital:

| Type of Capital | Book Value | Market Value | Specific Cost |
|-------------------|------------|--------------|---------------|
| Preference Shares | 4,00,000 | 5,25,000 | 15% |
| Equity Shares | 12,00,000 | 32,00,000 | 18% |
| Retained Earnings | 4,00,000 | — | |
| Debentures | 5,00,000 | 5,20,000 | 10% |

Determine the Weighted Average Cost of Capital using (a) Book Value Weights.

(b) Market Value Weights.

- Sol.** (a) Book Value Weights

| Type of capital | Amount (₹) | Proportion (%) | Cost (%) | WACC (%) |
|-------------------|------------|----------------|----------|----------|
| Preference Shares | 4,00,000 | 16 | 15 | 2.4 |
| Equity Shares | 12,00,000 | 48 | 18 | 8.64 |
| Retained Earnings | 4,00,000 | 16 | 18 | 2.88 |
| Debentures | 5,00,000 | 20 | 10 | 2 |
| | 25,00,000 | | | 15.92 |

(b) Market Value Weights

| Type of capital | Market Value (₹) | Proportion (%) | Cost (%) | WACC (%) |
|-------------------|------------------|----------------|----------|----------|
| Preference Shares | 5,25,000 | 12.37 | 15 | 1.8555 |
| Equity Shares | 32,00,000 | 75.38 | 18 | 13.5684 |
| Debentures | 5,20,000 | 12.25 | 10 | 1.225 |
| | 42,45,000 | | | 16.6489 |

26. The following information has been extracted from the balance sheet of Fashions Ltd. As on 31-03-2002:

| | |
|--------------------------|-----------|
| | (₹ Lakhs) |
| Equity | 400 |
| 12% Debentures | 400 |
| Term Loan (Interest 18%) | 1200 |
| | 2000 |

- (a) Determine the weighted average cost of capital of the company. It has been paying dividends at a consistent rate of 20% p.a.
- (b) What difference will it make if the current price of the ₹100 share is ₹160?
- (c) Determine the effect of Income-tax on the cost of capital under both premises if tax rate is 50%.

Sol. (a)

| Type of capital | Amount (₹ lakhs) | Proportion (%) | Cost (%) | WACC (%) |
|-----------------|------------------|----------------|----------|----------|
| Equity Shares | 400 | 20 | 20 | 4 |
| 12% Debentures | 400 | 20 | 12 | 2.4 |
| 18% Term Loan | 1,200 | 60 | 18 | 10.8 |
| | 2,000 | | | 17.2 |

$$\begin{aligned} \text{Cost of Equity} &= \frac{D_1}{P_0} \times 100 \\ &= \frac{80}{400} \times 100 \\ &= 20\% \end{aligned}$$

$$\begin{aligned} \text{Cost of Term Loan} &= \frac{D_1}{P_0} \times 100 \\ &= \frac{216}{1,200} \times 100 \\ &= 18\% \end{aligned}$$

$$\begin{aligned} \text{Cost of Debentures} &= \frac{I}{NP} \times 100 \\ &= \frac{48}{400} \times 100 \\ &= 12\% \end{aligned}$$

(b)

| Type of capital | Amount (₹ lakhs) | Proportion (%) | Cost (%) | WACC (%) |
|-----------------|------------------|----------------|----------|----------|
| Equity Shares | 400 | 20 | 12.5 | 2.5 |
| 12% Debentures | 400 | 20 | 12 | 2.4 |
| 18% Term Loans | 1,200 | 60 | 18 | 10.8 |
| | 2,000 | | | 15.7 |

$$\begin{aligned} \text{Cost of Equity} &= \frac{D_1}{P_0} \times 100 \\ &= \frac{20}{160} \times 100 = 12.5\% \end{aligned}$$

$$K_d = 12\%$$

$$K_t = 18\%$$

(c) After Tax

| Type of capital | Amount (₹ lakhs) | Proportion (%) | Cost (%) | WACC (%) |
|-----------------|------------------|----------------|----------|----------|
| Equity Shares | 400 | 20 | 20 | 4 |
| 12% Debentures | 400 | 20 | 6 | 1.2 |
| 18% Term Loan | 1,200 | 60 | 9 | 5.4 |
| | 2,000 | | | 10.6 |

$$K_e = 20\% \text{ [remains same as in part (a)]}$$

$$K_d = 12\% (1 - .5) = 6\%$$

$$K_t = 18\% (1 - .5) = 9\%$$

(ii)

| Type of capital | Amount (₹ lakhs) | Proportion (%) | Cost (%) | WACC (%) |
|-----------------|---------------------|----------------|----------|----------|
| Equity Shares | 400 | 20 | 12.5 | 2.5 |
| 12% Debentures | 400 | 20 | 6 | 1.2 |
| 18% Term Loan | 1,200 | 60 | 9 | 5.4 |
| | 2,000 | | | 9.1 |

$$K_e = 12.5\% \text{ [remains same as in part (b)]}$$

$$K_d = 12\% (1 - .5) = 6\%$$

$$K_t = 18\% (1 - .5) = 9\%$$

27. (b) Reliance Petro Ltd. issued 10,000 10% Preference Shares of ₹100 each at ₹98 redeemable after 5 years at a premium of 8%. The cost of issue of shares is ₹5 per share. Calculate the cost of Redeemable Preference Capital, assuming 10% dividend tax.

$$K_p = \frac{P_D + \left(\frac{P_n - P_0}{N} \right)}{\frac{P_n + P_0}{2}} \times 100$$

$$= 11 + \frac{108 - 93}{108 + 93} \times 100$$

$$= \frac{11 + 3}{100.5} \times 100$$

$$= 13.9$$

$$\left[\begin{array}{l} P_D = 10\% \text{ of } 100 = 10 \\ \text{Dividend Tax} = 10\% \text{ of } 10 = 1 \\ \text{Total dividend} = 10 + 1 = 11 \\ P_n = 100 + 8\% \text{ of } 100 = 108 \\ P_0 = 98 - 5 = 93 \end{array} \right]$$



6

Capital Structure

■ Numerical Problems

1. Rohit Ltd. is considering expansion of its operational facilities and following alternatives are available to finance the expansion:

| | Alternative A | Alternative B | Alternative C |
|-----------------|---------------|---------------|---------------|
| | (₹ in lakhs) | | |
| Share Capital | 200 | 80 | 40 |
| 14% Debenture | – | 80 | 60 |
| Loan @ 18% p.a. | – | 40 | 100 |

Expected rate of return before interest and taxes (EBIT) is 25%. The maximisation rate of dividend of the company is 20%. Rate of corporate tax is 50% which of the alternative would you choose?

Sol. **Calculation of Rate of Return on Share Capital** **(₹ in lakhs)**

| | Alternative A | Alternative B | Alternative C |
|--|---------------|---------------|---------------|
| EBIT (@ 25% on 200 lakhs) | 50.00 | 50.00 | 50.00 |
| Less: Interest on Debenture @ 14% p.a. | – | (11.20) | (8.40) |
| Interest on loan @ 18% p.a. | – | (7.20) | (18.00) |
| EBT | 50 | 31.60 | 23.60 |
| Less: Tax @ 50% | 25 | 15.80 | 11.80 |
| EAT for shareholders | 25 | 15.80 | 11.80 |
| Share Capital | 200 | 80 | 40 |
| Return on share capital $\frac{\text{EAT}}{\text{Share Capital}} \times 100$ | 12.5% | 19.75% | 29.5% |

In alternative C return on share capital is highest, so alternative C is more preferable. More over this alternative gives return 29.5% which is higher than minimum rate of dividend i.e., 20%.

2. The present capital structure of Riya and Co. is as under:

| | (₹) |
|--|-----------|
| 16,000 equity shares of ₹10 each | 16,00,000 |
| 8,000, 6% Preference shares of ₹100 each | 8,00,000 |
| 10% Debentures | 16,00,000 |
| | 40,00,000 |

The present earning before interest and taxes (EBIT) is ₹6,00,000. The company wants to expand which require an additional investment of ₹20,00,000. The additional investment will yield ₹2,00,000, before interest and tax. The tax rate is 50% and following alternatives are available:

- (i) Issue of equity shares at par
- (ii) Issue of Preference shares at par
- (iii) Issue of 14% Debentures at par

Examine it and suggest the best alternative.

Sol. Earning per Share (EPS)

| Present | (₹) |
|--|-----------------|
| EBIT | 6,00,000 |
| Less: Interest 16,00,000 × 10% | <u>1,60,000</u> |
| EBT | 4,40,000 |
| Less: Tax @50% | <u>2,20,000</u> |
| EAT | <u>2,20,000</u> |
| Less: Preferences dividend 8,00,000 × 6% | <u>48,000</u> |
| Earning for Equity Shareholders | <u>1,72,000</u> |

$$\text{EPS} = \frac{1,72,000}{16,000} = ₹10.75$$

Calculation of EPS after Expansion

| | Option I | Option II | Option III |
|---|----------|-----------|------------|
| EBIT 6,00,000 + 2,00,000 | 8,00,000 | 8,00,000 | 8,00,000 |
| Less: Interest 16,00,000 × 10% | 1,60,000 | 1,60,000 | 1,60,000 |
| 20,00,000 × 14% | — | — | 2,80,000 |
| EBT | 6,40,000 | 6,40,000 | 3,60,000 |
| Less: Tax @ 50% | 3,20,000 | 3,20,000 | 1,80,000 |
| EAT | 3,20,000 | 3,20,000 | 1,80,000 |
| Less: Preference dividend 8,00,000 × 6% | 48,000 | 48,000 | 48,000 |
| | | 1,20,000 | |

Earning per Share

$$\text{Option I} : \frac{2,72,000}{36,000} = ₹7.56$$

$$\text{Option II} : \frac{1,52,000}{16,000} = ₹9.50$$

$$\text{Option III} : \frac{1,32,000}{16,000} = ₹8.25$$

Option II, i.e., issue of preference share gives highest amount of EPS.

3. Zee company needs ₹5,00,000 for construction of 9 new building. For financing the project following 3 alternatives are available. You are required to suggest best alternative on the basis of earning per share criterion:

Alternative (i) Issue of 50,000 equity share of ₹100 each.

Alternative (ii) Issue of 25,000 equity share of ₹100 per share and 25,000, 8% preference of ₹100 each.

Alternative (iii) Issue of 25,000 equity share of ₹100 each and 25,000, 8% debenture of ₹100 each. The corporate tax rate is 50%.

The profit of the company before interest and taxes (EBIT) are ₹2,00,000, ₹4,00,000 ₹6,00,000 and ₹10,00,000.

Sol.

Earning for Shares

Alternative I

Issue of Equity Shares

| Particulars | (₹) | (₹) | (₹) | (₹) |
|---|----------|----------|----------|-----------|
| EBIT | 2,00,000 | 4,00,000 | 6,00,000 | 10,00,000 |
| Less: Interest | — | — | — | — |
| EBT | 2,00,000 | 4,00,000 | 6,00,000 | 10,00,000 |
| Less: Tax @ 50% | 1,00,000 | 2,00,000 | 3,00,000 | 5,00,000 |
| EAT for equity share holders | 1,00,000 | 2,00,000 | 3,00,000 | 5,00,000 |
| Number of equity shares | 50,000 | 50,000 | 50,000 | 50,000 |
| EPS = $\frac{\text{EAT}}{\text{No. of equity share}}$ | 2 | 4 | 6 | 10 |

Alternative II

Issue of Equity Share and Preference Share

| Particulars | (₹) | (₹) | (₹) | (₹) |
|-----------------|----------|----------|----------|-----------|
| EBIT | 2,00,000 | 4,00,000 | 6,00,000 | 10,00,000 |
| Less: Interest | — | — | — | — |
| EBIT | 2,00,000 | 4,00,000 | 6,00,000 | 10,00,000 |
| Less: Tax @ 50% | 1,00,000 | 2,00,000 | 3,00,000 | 5,00,000 |

| | | | | |
|---|------------|----------|----------|----------|
| EAT | 1,00,000 | 2,00,000 | 3,00,000 | 5,00,000 |
| Less: Dividend on preference shares (@ 8% on 25,00,000) | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| Earnings for equity shares | - 1,00,000 | NIL | 1,00,000 | 3,00,000 |
| No. of equity shares | 25,000 | 25,000 | 25,000 | 25,000 |
| EPS = $\frac{\text{Earnings for equity share}}{\text{No. of equity share}}$ | (₹ 4) | NIL | (₹ 4) | (₹ 25) |

Alternative III**Issue of Equity and Debentures**

| Particulars | (₹) | (₹) | (₹) | (₹) |
|------------------------------------|----------|----------|----------|-----------|
| EBIT | 2,00,000 | 4,00,000 | 6,00,000 | 10,00,000 |
| Less: Interest (@ 8% on 25,00,000) | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| EBT | NIL | 2,00,000 | 4,00,000 | 8,00,000 |
| Less: Taxes @ 50% | — | 1,00,000 | 2,00,000 | 4,00,000 |
| EAT for equity share holders | — | 1,00,000 | 2,00,000 | 4,00,000 |
| No. of equity shares | 25,000 | 25,000 | 25,000 | 25,000 |
| EPS | NIL | ₹ 4 | ₹ 8 | ₹ 16 |

4. A company going to install a new plant at an investment of ₹ 10,00,000. Earning before interest and tax (EBIT) from such plant will be ₹ 1,60,000. The current market price of share is ₹ 25 and will come down to ₹ 20, if the funds are borrowed in excess of ₹ 5,00,000. The equity shares can be issued or debt may be raised to ₹ 1,00,000 or ₹ 4,00,000 or ₹ 6,00,000. Funds can be borrowed at the interest rate as given under:

Upto ₹ 1,00,000 @ 8%

Over ₹ 1,00,000 to ₹ 5,00,000 @ 12% and over ₹ 5,00,000 @ 18%

The tax rate is 50%. Calculate EPS, suggest best option.

Sol.

Calculation of EPS

| Particulars | Alternative I | Alternative II | Alternative III |
|----------------------|---------------|----------------|-----------------|
| | (₹ 1,00,000) | (₹ 4,00,000) | (₹ 6,00,000) |
| EBIT | 1,60,000 | 1,60,000 | 1,60,000 |
| Less: Interest | 8,000 | 44,000 | 74,000 |
| EBT | 1,52,000 | 1,16,000 | 86,000 |
| Less: Tax @ 50% | 76,000 | 58,000 | 43,000 |
| EAT | 76,000 | 58,000 | 43,000 |
| No. of equity shares | 9,00,000 | 6,00,000 | 4,00,000 |
| | 25 | 25 | 25 |
| | = 36,000 | = 24,000 | = 20,000 |
| EPS | 76,000/36,000 | 58,000/24,000 | 43,000/20,000 |
| | = ₹ 2.11 | = ₹ 2.42 | = ₹ 2.15 |

Alternative II in best.

Working Notes:

(1) Calculation of Interest:

| | | |
|--|---|---------------|
| Alternative I: 1,00,000 × 8% | = | 8,000 |
| Alternative II: upto 1,00,000 @ 8% | = | 8,000 |
| Next 3,00,000 @ 12% | = | <u>36,000</u> |
| | | <u>44,000</u> |
| Alternative III: upto 1,00,000 @ 8% | = | 8000 |
| next 4,00,000 @ 12% | = | 48,000 |
| balance 1,00,000 @ 18% | = | <u>18,000</u> |
| | | <u>74,000</u> |

(2) Calculation of Equity Capital

| | I | II | III |
|----------------------------|-----------|-----------|-----------|
| Funds Required | 10,00,000 | 10,00,000 | 10,00,000 |
| Less: Financial from debts | 1,00,000 | 4,00,000 | 6,00,000 |
| Equity Capital | 9,00,000 | 6,00,000 | 4,00,000 |

5. EBIT of Akash Ltd is expected to be ₹10,00,000. In its capital structure the company is having 12% Debentures of ₹30,00,000. The cost of equity capitalisation is 16%. You are asked to calculate value of firm and overall cost of capital according to Net Income (NI) approach.

Sol.

Calculation of Value of Firm

| | (₹) |
|--|-----------------|
| EBIT | 10,00,000 |
| Less: Interest on debentures (30,00,000 × 12%) | 3,60,000 |
| Earnings available to equity shareholders (N ₁) | <u>6,40,000</u> |
| Equity capitalisation rate (K _e) = 16% | |
| Market value of equity (S) = $\frac{N_1}{K_e} = \frac{6,40,000}{16} = 40,00,000$ | |
| Market value of debentures (B) = <u>30,00,000</u> | |
| Market value of firm (S + B) = <u>70,00,000</u> | |
| Calculation of overall cost of capital | |
| $K_0 = \frac{\text{EBIT}}{V} = \frac{10,00,000}{70,00,000} \times 100 = 14.28\%$ | |

6. In problem 5 (as given above), if the firm decides to raise further ₹20,00,000 by issue of debenture and to use proceeds thereof to redeem equity shares, what shall be the value of firm and overall cost of capital according to N₁ Approach.

Sol.

| | (₹) |
|--|-----------|
| Value of Firm | 10,00,000 |
| EBIT | |
| Less: Interest on debentures (50,00,000 × 12%) | 6,00,000 |
| Earnings for equity shareholders | 4,00,000 |
| (Equity) $S = \frac{4,00,000}{.16}$ | 25,00,000 |
| (Debt) B | 50,00,000 |
| Value of firm (V) | 75,00,000 |
| $K_0 = \frac{10,00,000}{75,00,000} \times 100 = 13.33\%$ | |

7. Two companies M and N are identical. The financial detail of both the companies are given as below:

| | Company M | Company N |
|---------------------|-----------|-----------|
| Total Assets | 60,00,000 | 60,00,000 |
| EBIT | 20% | 20% |
| 10% Debenture | 36,00,000 | — |
| Equity Capital | 44,00,000 | 60,00,000 |
| Capitalisation Rate | 15% | 15% |

Assuming a tax rate of 50%, compute the value of M and N using (i) Net Income Approach
(ii) Net operating income approach.

Sol.: (i) NI Approach

| Particulars | M Ltd. | Y Ltd. |
|---|-----------|-----------|
| EBIT 60,00,000 @ 20% | 12,00,000 | 12,00,000 |
| Less: Interest on debentures | 3,60,000 | — |
| | 8,40,000 | 12,00,000 |
| Less: Tax @ 50% | 4,20,000 | 6,00,000 |
| Earning available for equity shareholders | 4,20,000 | 6,00,000 |
| Capital value of equity (S) | | |
| $\frac{4,20,000}{.15}$ and $\frac{6,00,000}{.15}$ | 28,00,000 | 40,00,000 |
| Value of debt (B) | 36,00,000 | — |
| | 64,00,000 | 40,00,000 |

(ii) Net Operating Income (NOI) Approach:

$$\text{Value of unlowered company (N Ltd.)} = \frac{\text{EBIT}(1-t)}{K_e} = \frac{12,00,000}{.15} (.5)$$

| | | |
|-------------------------------------|---|------------------|
| Value of lowered company (M Ltd.) | = | 40,00,000 |
| Value of unlowered company | | 40,00,000 |
| Value of debt $36,00,000 \times .5$ | | <u>18,00,000</u> |
| | | <u>5,80,000</u> |

8. A Co, Ltd. was an operating income of ₹1,60,000 and outstanding debt of ₹8,00,000 at 10% rate of interest. If the overall capitalisation rate is 12.5%, calculate the value of firm and cost of equity.

Sol. EBIT = 1,60,000

Overall cost of capital $K_e = 0.125$

$$\text{Value of firm} = \frac{\text{EBIT}}{K_0} = \frac{1,60,000}{0.125} = ₹12,80,000$$

(₹)

$$V = 12,80,000$$

$$\text{Debt (B)} = \underline{8,00,000}$$

$$\text{Market value of equity (V-B)} = \underline{4,80,000}$$

$$\text{Equity capitalisation rate } K_e = \frac{\text{EBIT} - I}{V - B} = \frac{1,60,000 - 80,000}{4,80,000} = 16.67\%$$

9. Examine the effect of change on Capital structure of problem No. 8, if the debt is increased by 4,00,000 and equity reduced by same amount.

Sol. EBIT = 1,60,000

$$K_0 = 0.125$$

$$V = ₹12,80,000$$

$$\text{Debt (B)} = \underline{₹12,00,000}$$

$$\text{Market value of equity} = \underline{80,000}$$

$$\text{Equity capitalisation rate (} K_e) = \frac{1,60,000 - 1,20,000}{80,000} = 50\%$$

10. In the problem No. 8, if debt is reduced by ₹4,00,000 and firm issued equity shares of the same amount, what will be effect on value of firm and cost of equity.

Sol. (₹)

$$\text{EBIT} = 1,60,000$$

$$K_0 = 0.125$$

$$V = \frac{\text{EBIT}}{K_0} = \frac{1,60,000}{0.125} = ₹12,80,000$$

$$V \text{ (Value of firm)} = ₹12,80,000$$

$$B \text{ (Value of debt)} = \underline{₹4,00,000}$$

$$S \text{ (Value of equity)} V - B = ₹8,80,000$$

$$K_e \text{ (Cost of equity)} = \frac{1,60,000 - 40,000}{8,80,000} = 13.64\%$$

11. EBIT of a company is ₹2,00,000. Expected returns on its capital 12.5%. Calculate value of firm according to MM theory.

Sol. According to value of firm $(V) = \frac{\text{EBIT}}{K_0} = \frac{2,00,000}{.125} = ₹16,00,000$

12. There are two firms A and B which are exactly identical except that A does not use any debt in its financing, while B has ₹2,00,000, 5% debentures in its financing. Both the firms having EBIT of ₹50,000 and equity capitalisation rate is 10%. Assuming corporate tax rate 50%, calculate value of firm using MM model.

Sol. Market value of firm A

$$\begin{aligned} V_u &= \frac{\text{EBIT}}{K_0}(1-t) \\ &= \frac{50,000}{.10}(1-0.5) = ₹2,50,000 \end{aligned}$$

Market value of firm B

$$\begin{aligned} V_2 &= V_u + tB \\ &= 2,50,000 + 2,00,000(.5) = ₹3,50,000 \end{aligned}$$

13. A project under consideration by your company requires a capital investment of ₹60 lakhs. Interest on term loan is 10% p.a. and tax rate is 50% Calculate the point of indifference for the project, if the debt-equity ratio insisted by the financing agencies is 2:1:

Solution: As the debt equity ratio insisted by the financing agencies is 2:1, the company has two alternative financial plans:

- (i) Raising the entire amount of ₹60 lakhs by the issue of equity shares, thereby using no debt, and
- (ii) Raising ₹40 lakhs by way of debt and ₹20 lakh by issue of equity share capital.

Sol. Calculation of point of Indifference:

$$\frac{(X - I_1)(1 - T) - PD}{S_1} = \frac{(X - I_2)(1 - T) - PD}{S_2}$$

Where, X = Point indifference

I_1 = Interest under alternative 1, i.e., .0

I_2 = Interest under alternative 2, i.e., $10/100 \times 40 = 4$

T = Tax rate, i.e., 50% or .5

PD = Preference Dividend, i.e., 0 as there are no preference shares.

S_1 = Amount of equity capital under alternative 1, i.e., 60.

S_2 = Amount of equity capital under alternative 2, i.e., 20.

Substituting the values:

$$\frac{(X-0)(1-.5)-0}{60} = \frac{(X-4)(1-.5)-0}{20}$$

Or, $\frac{.5X}{60} = \frac{.5X - 2}{20}$

$$\text{Or, } 20(.5X) = 60(.5X - 2)$$

$$\text{Or, } 10X = 30X - 120$$

$$\text{Or, } X = 6$$

Thus, EBIT, earnings before interest and tax, at point of indifference is ₹6 lakhs. At this level (6 lakh) of EBIT, the earnings on equity after tax will be 5% p.a. irrespective of alternative debt equity mix when the rate of interest on debt is 10% p.a.

14. Debarathi Co. Ltd., is planning an expansion programme. It requires ₹20 lakhs of external financing for which it is considering two alternatives. The first alternative calls for issuing 15,000 equity shares of ₹100 each and 5,000 10% Preference Shares of ₹100 each; the second alternative requires 10,000 equity shares of ₹100 each, 2,000 10% Preference Shares of ₹100 each and ₹8,00,000 Debentures carrying 9% interest. The company is in the tax bracket of 50%. You are required to calculate the indifference point for the plans and verify your answer by calculating the EPS.

Sol. Capital Structure

| | Plan I (₹) | Plan II (₹) |
|------------------------------|------------------|------------------|
| Equity share capital | 15,00,000 | 10,00,000 |
| 10% preference share capital | 5,00,000 | 2,00,000 |
| 9% debentures | — | 8,00,000 |
| Total | 20,00,000 | 20,00,000 |
| Number of equity shares | 15,000 | 10,000 |

Let, at X level of EBIT, the EPS under both the plan will be same.

$$\text{EPS under 1st alternative: } \frac{X(1-t) - P_d}{N_1} = \frac{X(1-0.5) - 50,000}{15,000}$$

$$\text{Again, EPS under 2nd Alternative: } \frac{(X-1) (1-t) - P_d}{N_2} = \frac{(X-72,000) (1-0.5) - 20,000}{10,000}$$

Now, equalizing both the EPS we get:

$$\Rightarrow \frac{X(1-0.5) - 50,000}{15,000} = \frac{(X-72,000)(1-0.5) - 20,000}{10,000}$$

$$\Rightarrow \frac{0.5X - 50,000}{15,000} = \frac{0.5X - 36,000 - 20,000}{10,000}$$

$$\Rightarrow \frac{0.5X - 50,000}{3} = \frac{0.5X - 56,000}{2}$$

$$\Rightarrow 1.5X - 1,68,000 = X - 1,00,000$$

$$\therefore X = \frac{68,000}{0.5} = ₹ 1,36,000$$

We may verify the result by calculating EPS under both the plans.

Computation of EPS under Different Plans

| | Plan I | Plan II |
|--|----------|----------|
| EBIT | 1,36,000 | 1,36,000 |
| Less: Interest | | 72,000 |
| EBT | 1,36,000 | 64,000 |
| Less: Tax | 68,000 | 32,000 |
| EAT | 68,000 | 32,000 |
| Less: Preference dividend | 50,000 | 20,000 |
| Earning available to equity shareholders | 18,000 | 12,000 |
| No. of equity shares | 15,000 | 10,000 |
| | 18,000 | 12,000 |
| ∴ EPS = $\frac{\text{Earning available to equity shareholders}}{\text{Number of equity shares}}$ | 15,000 | 10,000 |
| | = ₹ 1.20 | = ₹ 1.20 |



7

Leverages

■ Numerical Questions

1. Following is the cost information of a firm:

Fixed Cost = ₹50,000

Variable Cost = 70% of sales

Sales = ₹2,00,000 in previous year and ₹2,50,000 in current year.

Find out percentage change in sales and operating profits when:

- Fixed costs are not there (no leverage).
- Fixed cost are there (leveraged situation).

Sol.

| (i) | Previous year | Current year | Percentage Change |
|------------------------------------|---------------|--------------|-------------------|
| | (₹) | (₹) | (₹) |
| Sales | 2,00,000 | 2,50,000 | 25% |
| Less: Variable cost (70% of sales) | 1,40,000 | 1,75,000 | 25% |
| Profit from operations | 60,000 | 75,000 | 25% |
| (ii) | Previous year | Current year | Percentage Change |
| | (₹) | (₹) | (₹) |
| Sales | 2,00,000 | 2,50,000 | 25% |
| Less: Variable cost (70% of sales) | 1,40,000 | 1,75,000 | 25% |
| Contribution | 60,000 | 75,000 | 25% |
| Less: Fixed Cost | 50,000 | 50,000 | |
| Profit from operations | 10,000 | 25,000 | 150% |

Comments:

- In situation (i) where there are no fixed costs (or absence of leverage) the percentage change in sales and percentage change in operating profit is the same i.e., 25%.
- In situation (ii) where there are fixed costs, the leverage being occurring, the percentage change in profits (150%) is much more than the percentage change in sales (25%).
- The fixed cost element has helped in magnifying the percentage increase in operating profits.

Risk Factor:

It is true that a high leveraged situation will magnify the operating profits but it brings in the risk element too. The percentage change in profits will be more in a situation with higher fixed costs as compared to that where fixed costs are lower. The higher degree of leverage brings in more decrease in operating profits. This situation can be illustrated with the help of the following illustration.

2. Following information is taken from the records of a hypothetical company:

| | |
|------------------------|-------------|
| Installed capacity | 1,000 units |
| Operating capacity | 800 units |
| Selling price per unit | ₹10 |
| Variable cost per unit | ₹7 |

Calculate operating leverage under the following situations:

| | |
|--------------|-------|
| Fixed Costs: | ₹ |
| Situation A | 800 |
| Situation B | 1,200 |
| Situation C | 1,500 |

Sol.

| | Situation A | Situation B | Situation C |
|---|-------------|-------------|-------------|
| | (₹) | (₹) | (₹) |
| Sales | 8,000 | 8,000 | 8,000 |
| Less: Variable cost | 5,600 | 5,600 | 5,600 |
| Contribution (C) | 2,400 | 2,400 | 2,400 |
| Less: Fixed Cost (F) | 800 | 1,200 | 1,500 |
| Operating Profit (OP) | 1,600 | 1,200 | 900 |
| Operating leverage | 2,400 | 2,400 | 2,400 |
| $\left(\frac{C}{OP}\right)$ | 1,600 | 1,200 | 900 |
| Break Even Point (BEP) | 1.5 | 2.0 | 2.67 |
| $\left(\frac{F}{C} \times S\right)$ | 2.667 | 4.000 | 5.000 |
| Margin of Safety Ratio | 66.7% | 50% | 37.5% |
| $\left(\frac{OP}{C}\right)$ | 66.7% | 50% | 37.5% |
| Percentage of Sales at break even point | 33.3% | 50% | 62.5% |

A 10 per cent increase in sales would be accompanied by an increase in operating profits of 15% in situation A, 20% in situation B and 26.7% in situation C. Situation C is of high operating leverage since the operating profit will increase by one $2\frac{1}{2}$ times (26.7% for every

10% increase in Sales). This is high risk situation too because a small decrease in sales will result in more decrease in profits.

The margin of safety ratio is 66.7% in situation A which means that a sales decrease of this percentage will bring the firm to break-even point (no profit no loss point). This ratio in situation C is only 37.5% which means that the company can reach the break even situation much more early as compared to situation A.

Taking the percentage of sales at break-even point; it will reach at 33.3% of sales in situation A, 50% in situation B and 62.5% in situation C. In situation A the company will start earning profit at an early stage of sales while in situation C it will reach only beyond 62.5% in situation C. In situation A the company will start earning profit at an early stage of sales while in situation C, it will reach only beyond 62.5% of sales.

A high operating leverage (situation C) has low margin of safety and has thin cushion for absorbing shocks whereas a situation of low operating leverage (situation A) has higher margin of safety ratio. This situation is less risky because any decrease in sales will not bring down the profits at a higher rate.

It can be concluded that a high leveraged situation brings in more profits with the increase in sales but at the same time it brings in more risk too.

3. S Ltd. has the following capital structure:

Equity share Capital ₹1,00,000

8% Debenture ₹1,25,000

The present EBIT is ₹50,000. Calculate Financial Leverage assuming that company is in 50% tax bracket.

| | |
|----------------------|---|
| Sol. EBIT | ₹50,000 |
| Less: Interest | <u>₹10,000</u> |
| PAT | <u>₹40,000</u> |
| Financial Leverage = | $\frac{\text{EBIT}}{\text{EBIT} - \text{I}} = \frac{50,000}{40,000} = 1.25$ |

4. EBIT of a company is ₹1,60,000. Its capital structure consists of 10% debentures of ₹5,00,000; 12% Preference shares of ₹1,00,000 and equity shares worth ₹4,00,000. Determine the degree of financial leverage at current level of EBIT. Also determine the degree of financial leverage if EBIT increases by 30% and decreases by 30%. Tax rate is 55%.

Sol.

| | Current | EBIT Increased by 30% | EBIT Decreased by 30% |
|-----------------------|----------|-----------------------|-----------------------|
| EBIT | 1,60,000 | 2,08,000 | 1,12,000 |
| Interest on Debenture | 50,000 | 50,000 | 50,000 |
| EBT | 1,10,000 | 1,58,000 | 62,000 |
| Tax 55% | 60,500 | 86,900 | 34,100 |
| EAT | 49,500 | 71,100 | 27,900 |

Financial Leverage

$$\text{Current} = \frac{1,60,000}{1,10,000} = 1.45$$

$$30\% \text{ Increased EBIT} = \frac{2,08,000}{1,58,000} = 1.32$$

$$30\% \text{ decreased EBIT} = \frac{1,12,000}{62,000} = 1.81$$

5. A company has the following capital structure:

| | |
|---|----------|
| 10,000 equity share of ₹10 each | 1,00,000 |
| 2,000 10% preference share of ₹100 each | 2,00,000 |
| 2,000 10% debentures of ₹100 each | 2,00,000 |

Calculate EPS for each of following levels of following levels of EBIT:

(i) ₹1,00,000; (ii) 60,000; (iii) 1,40,000.

The company is in the 50% tax bracket.

Also, calculate financial leverage under (i) as base.

Sol. Computation of Earning per share

| | (i) | (ii) | (iii) |
|--|----------|--------|----------|
| EBIT | 1,00,000 | 60,000 | 1,40,000 |
| Less: Interest on Debentures | 20,000 | 20,000 | 20,000 |
| PBT | 80,000 | 40,000 | 1,20,000 |
| Less: Income Tax | 40,000 | 20,000 | 60,000 |
| PAT | 40,000 | 20,000 | 60,000 |
| Less: Preference Dividend | 20,000 | 20,000 | 20,000 |
| Earnings available for Equity Shareholders (EAES) | 20,000 | — | 40,000 |
| Earning per share (EPS) | 2 | Nil | 4 |

The above table shows that

- In case (ii) the EBIT has decreased by 40 per cent (i.e., from ₹1,00,000 to ₹60,000 while the earning per share has decreased by 100 per cent (from ₹2 per share to nil).
- In case (iii) the EBIT has increased by 40 per cent (from ₹1,00,000 to ₹1,40,000) as compared to case (i) while the earning per share has increased by 100 per cent (from ₹2 to ₹4).

The degree of financial leverage can therefore be computed as follows:

$$\frac{\text{Percentage Change in EPS}}{\text{Percentage Change in EBIT}}$$

$$\text{Financial leverage in between (i) and (ii)} = \frac{100}{40} = 2.5$$

6. A company has sales of ₹10,00,000, variable costs of ₹6,00,000, fixed costs of ₹2,00,000 and long-term loans of ₹8,00,000 at 10% rate of interest. Calculate the composite leverage.

$$\begin{aligned} \text{Sol. Operating Leverage} &= \frac{C}{\text{EBIT}} \\ &= \frac{10,00,000 - 6,00,000}{10,00,000 - 6,00,000 - 2,00,000} = \frac{4,00,000}{2,00,000} = 2 \end{aligned}$$

$$\begin{aligned} \text{Financial Leverage} &= \frac{\text{EBIT}}{\text{EBIT} - I} \\ &= \frac{20,000}{2,00,000 - 80,000} = \frac{2,00,000}{1,20,000} = \frac{5}{3} \end{aligned}$$

$$\begin{aligned} \text{Composite Leverage} &= \text{OL} \times \text{FL} \\ &= \frac{2}{1} \times \frac{5}{3} = \frac{10}{3} \end{aligned}$$

7. A simplified income statement of R Ltd. is given below. Calculate and interpret its degree of operating leverage, degree of financial leverage and degree of combined leverage.

Income Statement of R Ltd. for the year ended 31st March 2005:

| | |
|---------------|----------|
| Sales | 5,25,000 |
| Variable Cost | 3,83,500 |
| Fixed Cost | 37,500 |
| EBIT | 1,04,000 |
| Interest | 55,000 |
| Taxes (30%) | 14,700 |
| Net Income | 34,300 |

$$\text{Sol. Operating Leverage} = \frac{C}{\text{EBIT}} = \frac{5,25,000 - 3,83,500}{1,04,000} = 1.36$$

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBIT} - I} = \frac{1,04,000}{1,04,000 - 55,000} = \frac{1,04,000}{49,000} = 2.12$$

$$\text{Composite Leverage} = 1.36 \times 2.12 = 2.88$$

8. A firm has sales of ₹20,00,000, variable cost ₹14,00,000 and fixed cost of ₹4,00,000 and debt of ₹10,00,000 at 10% rate of interest. What are the operating, financial and combined leverages? If the firm wants to double its Earnings before Interest and Tax (EBIT), how much of a rise in sales would be needed on a percentage basis?

Sol.

| Statement of Profit | (₹) |
|---------------------|-----------|
| Sales | 20,00,000 |
| Less: Variable Cost | 14,00,000 |
| Contribution | 6,00,000 |

| | |
|--------------------------------------|----------|
| Less: Fixed Cost | 4,00,000 |
| Operating Profit (EBIT) | 2,00,000 |
| Less: Interest at 10% on ₹ 10,00,000 | 1,00,000 |
| Profit Before Tax (PBT) | 1,00,000 |

Calculation of Leverages

$$\begin{aligned}
 \text{(a) Operating Leverage} &= \frac{\text{Contribution}}{\text{Operating Profit (EBIT)}} \\
 \text{Or, O.L.} &= \frac{6,00,000}{2,00,000} = 3 \\
 \text{(b) Financial Leverage} &= \frac{\text{Earning before Interest and Tax}}{\text{Profit before Tax}} \\
 \text{Or, F.L.} &= \frac{2,00,000}{1,00,000} = 2 \\
 \text{(c) Combined Leverage} &= \text{Operating Leverage} \times \text{Financial Leverage} \\
 \text{Or, C.L.} &= 3 \times 2 = 6
 \end{aligned}$$

Rise in Sales Needed to Double its EBIT:

As the operating leverage is 3, when sales increase by 100% operating profit will increase by 300%. Thus, $33\frac{1}{3}\%$ rise in sales volume will increase the operating profit by 100%, i.e., double the earnings before interest and tax.

Verification:

| | (₹) |
|--|-----------|
| Sales (after $33\frac{1}{3}\%$ increase) | 26,66,667 |
| Less: Variable Cost | 18,66,667 |
| Contribution | 8,00,000 |
| Less: Fixed cost | 4,00,000 |
| Operating Profit or EBIT | 4,00,000 |

9. The following figures relate to two companies:

| | P Ltd. | Q Ltd. |
|-------------------|--------------|--------------|
| | (in ₹ lakhs) | (in ₹ lakhs) |
| Sales | 500 | 1,000 |
| Variable costs | 200 | 300 |
| Contribution | 300 | 700 |
| Fixed costs | 150 | 400 |
| | <u>150</u> | <u>300</u> |
| Interest | 50 | 100 |
| Profit before tax | 100 | 200 |

You are required to:

- (i) Calculate the operating, financial and combined leverages for the two companies; and
- (ii) Comment on the relative risk position of them.

Sol.

| (i) Calculation of Leverages | P Ltd. | Q Ltd. |
|---|-------------------------|---------------------------|
| (a) Operating Leverage = $\frac{\text{Contribution}}{\text{Earnings before interest and tax}}$ | $\frac{300}{150} = 2$ | $\frac{700}{300} = 2.333$ |
| (b) Financial Leverage = $\frac{\text{Earnings before interest and tax}}{\text{Earnings before tax}}$ | $\frac{150}{100} = 1.5$ | $\frac{300}{200} = 1.5$ |
| (c) Combined Leverage = OL × FL Or $\frac{\text{Contribution}}{\text{Profit before tax}}$ | $\frac{300}{100} = 3$ | $\frac{700}{200} = 3.5$ |

(ii) Comments on the Relative Risk Position:

(a) Operating Leverage:

As the operating leverage for Q Ltd. is higher than that of P Ltd; Q Ltd. has a higher degree of operating risk. The tendency of operating profit to vary disproportionately with sales is higher for Q Ltd. as compared to P Ltd.

(b) Financial Leverage:

Since finance leverage for the two companies is the same, both the companies have the same degree of financial risk, i.e., the tendency of net disproportionately is the same for P Ltd. and Q Ltd.

(c) Combined Leverage:

As the combined leverage for Q Ltd. is higher than P Ltd.; Q Ltd. has overall higher risk as compared to P Ltd.

- 10.** A firm's sales, variable cost and fixed cost amount to ₹75,00,000, ₹42,00,000 and ₹6,00,000 respectively. It has borrowed ₹45,00,000 at 9% and its equity capital totals ₹55,00,000.

- (a) What are operating, financial and combined leverages of firm?
- (b) If sales drop to ₹50,00,000 what will the new EBIT be?

Sol. (a) (In Lakhs) EBIT = 75 - 45 - 6 = 27

$$OL = \frac{75 - 42}{27} = 1.22$$

$$FL = \frac{27}{27 - 4.05} = 1.18$$

$$CL = 1.22 \times 1.18 = 1.41$$

(b) Sales = 50,00,000

$$VC \frac{42}{75} \times 50 = 28,00,000$$

$$FC = \underline{8,00,000}$$

$$EBIT = \underline{16,00,000}$$

11. Consider the following data of PQR Ltd:

| | ₹ |
|------------------------|----------|
| Selling price per unit | 120 |
| Variable cost per unit | 80 |
| Fixed cost | 6,00,000 |
| Interest burden | 2,00,000 |
| Tax rate | 50% |
| Preference dividend | 1,00,000 |

Calculate the tree type of leverages if the number of units sold is 10,000 units.

Sol. Sales $10,000 \times 120 = 12,00,000$
 Less: Variable Cost $= 8,00,000$
 Fixed Cost $= \underline{6,00,000}$
 EBIT $= -2,00,000$
 Less: Interest $= \underline{-2,00,000}$
 EBT $= -4,00,000$
 Financial Leverage $= \frac{-2,00,000}{-4,00,000} = -0.5$
 Operating Leverage $= \frac{C}{EBIT} = \frac{12,00,000 - 8,00,000}{-4,00,000} = \frac{4,00,000}{-2,00,000} = -2$

Combined Leverage $= -0.5 \times -2 = 1$

12. Alpha company has a capital of ₹2,00,000 dividend into shares of 10 each. In its expansion programme it requires ₹1,00,000. Following alternatives for financing such expansion are available:

- (i) Issue of 10,000 shares of ₹10 each.
- (ii) Issue of 10,000, 12% preference shares of ₹10 each.
- (iii) Issue of 10% debentures of ₹1,00,000.

The company's current EBIT is ₹60,000 p.a. Calculate the effect of each of above alternatives of financing on earning per share (EPS) if:

- (a) EBIT continues to be the same after expansion
- (b) EBIT increases by ₹20,000.
- (c) Assume tax liability is 50%.

Sol.: Current EBIT $\text{₹}60,000$
 EBIT $\text{₹}60,000$
 Tax @ 50% $\text{₹}30,000$
 Earning for equity shares $\underline{\text{₹}30,000}$

$$\text{EPS} = \frac{30,000}{20,000} = ₹1.5$$

EBIT increased by ₹20,000.

| | Plan I | Plan II | Plan III |
|---|---------------|---------------|---------------|
| EBIT (60,000 + 20,000) | 80,000 | 80,000 | 80,000 |
| Less: Interest | — | — | 10,000 |
| EBT | 80,000 | 80,000 | 70,000 |
| Less: Tax @ 50% | 40,000 | 40,000 | 35,000 |
| EAT | 40,000 | 40,000 | 35,000 |
| Less: Preference dividend 1,00,000 × 12% | — | 12,000 | — |
| Earning Available to equity share holders | 40,000 | 28,000 | 35,000 |
| EPS | <u>40,000</u> | <u>28,000</u> | <u>35,000</u> |
| | 30,000 | 20,000 | 20,000 |
| | = ₹ 1.33 | = ₹ 1.4 | = ₹ 1.75 |

Comment: EPS is highest in case of financing through debt.



8

Working Capital Management

■ Numerical Questions

1. X and Y who wants in the first year's trading. The following estimates are available and you are asked to add 10% to allow for contingencies:

| Particulars | Per annum (₹) |
|---|------------------|
| (i) Average amount locked up in stocks: | |
| Stock of finished products and work-in-progress | 1,000 |
| Stock of stores, material, etc. | 1,600 |
| (ii) Average credit given: | |
| Home Market — 2 weeks credit | 15,600 |
| Foreign Market — 6 weeks credit | 62,400 |
| (iii) Time available for payment: | |
| For purchases — 4 weeks | 19,200 |
| For wages and overheads — 2 weeks | 52,000 |

Calculate the average amount of working capital required:

Sol. Calculation of Working Capital required

| Particulars | (₹) |
|---|--------|
| Current Assets | |
| Stock of finished goods and work-in-progress | 1,000 |
| Stock of stores, material, etc. | 1,600 |
| Debtors | |
| Home Market $\left(15,600 \times \frac{2}{52}\right)$ | 600 |
| Foreign Market $\left(62,400 \times \frac{6}{52}\right)$ | 7,200 |
| | 10,400 |
| Current Liabilities | |
| Creditors $\left(19,200 \times \frac{4}{52}\right)$ | 1,477 |
| Outstanding wages and Overheads $\left(52,000 \times \frac{2}{52}\right)$ | 2,000 |
| Add: Provision for contingencies | 6,923 |
| | 6,923 |
| Working Capital required | 7,615 |

2. Messers Philips and Philips who want to buy a business request you to tell them about the working capital requirements in the first year of their trading. The following information is provided to you:

| Particulars | (₹) |
|---|----------|
| (i) Average amount locked up in inventories: | |
| Raw Materials | 20,000 |
| Finished goods | 40,000 |
| (ii) Credit sales per annum (Debtors are allowed 2 months' credit) | 2,40,000 |
| (iii) Manufacturing expenses per annum | 96,000 |
| Wages per annum | 1,44,000 |
| (Lag in payment of manufacturing expenses and wages is one month) | |
| (iv) Raw materials consumed per annum (creditors allow 3 months' credit) | 96,000 |
| You may add 10% to allow for contingencies | |

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|----------|
| Current Assets | |
| Raw Material | 20,000 |
| Finished goods | 40,000 |
| Debtors $\left(2,40,000 \times \frac{2}{12}\right)$ | 40,000 |
| | 1,00,000 |
| Current Liabilities | |
| Outstanding Manufacturing Expenses $\left(96,000 \times \frac{1}{12}\right)$ | 8,000 |
| Outstanding wages $\left(1,44,000 \times \frac{1}{12}\right)$ | 12,000 |
| Creditors $\left(96,000 \times \frac{3}{12}\right)$ | 24,000 |
| | 56,000 |
| Add: Provision for contingencies | 5,600 |
| Working Capital | 61,600 |

3. From the following information prepare a statement in columnar form showing the estimated working capital requirements:
- (a) in total, and
- (b) as regards each constituent part of Working Capital. Budgeted Sales ₹26,000 per annum. Analysis of cost of each unit:

| Particulars | (₹) |
|--------------|-----------|
| Raw Material | 4 |
| Labour | 3 |
| Overheads | 2 |
| Profit | 1 |
| | <u>10</u> |

It is estimated that:

- Pending use, raw materials are carried in stock for three weeks and finished goods for two weeks.
- Factory processing will take three weeks.
- Suppliers will give five weeks credit and consumers will require eight weeks credit. It may be assumed that production and overheads accrue evenly throughout the year.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|---|--------|
| Current Assets | |
| Raw Material = $1,04,000 \times \frac{3}{52}$ | 6,000 |
| Work-in-Progress = $2,34,000 \times \frac{3}{52}$ | 13,500 |
| Finished goods = $2,34,000 \times \frac{2}{52}$ | 9,000 |
| Debtors $\left(2,34,000 \times \frac{8}{52}\right)$ | 36,000 |
| Less: Current Liabilities | |
| Creditors $\left(1,04,000 \times \frac{5}{52}\right)$ | 10,000 |
| Working Capital | 54,500 |

Working Note:

| | | | |
|--------------|---------------------|---|-----------------|
| Raw Material | $(26,000 \times 4)$ | = | 1,04,000 |
| Labour | $(26,000 \times 3)$ | = | 78,000 |
| Overheads | $(26,000 \times 2)$ | = | 52,000 |
| | | | <u>2,34,000</u> |

4. From the following information, prepare a statement showing the average amount of working capital required by A Ltd.

Annual Sales are estimated at 1,00,000 units at ₹10 unit. Production quantities coincide with sales and will be carried on evenly throughout the year and production cost is:

| Particulars | Per unit (₹) |
|-------------|--------------|
| Material | 5 |
| Labour | 2 |
| Expenses | 1.75 |

Customers are given 60 days credit and 50 days credit is taken from suppliers. 40 days supply of raw materials and 15 days supply of finished goods are kept.

Production cycle is 20 days and all materials are issued at the commencement of each production cycle.

A cash balance equivalent to one-third of the average of other working capital requirements is kept for contingencies.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|----------|
| Current Asset | |
| Raw Material $\left(5,00,000 \times \frac{40}{360}\right)$ | 55,556 |
| Work-in-Progress $\left(8,75,000 \times \frac{20}{360}\right)$ | 48,611 |
| Finished goods $\left(8,75,000 \times \frac{15}{360}\right)$ | 36,458 |
| Cash (Working Note) | 72,338 |
| Debtors $\left(8,75,000 \times \frac{60}{360}\right)$ | 1,45,833 |
| | 3,58,796 |
| Less: Current Liabilities | |
| Creditors $\left(5,00,000 \times \frac{50}{360}\right)$ | 69,444 |
| | 2,89,352 |

Working Note:

Raw Materials $(1,00,000 \times 5) = 5,00,000$

Labour $(1,00,000 \times 2) = 2,00,000$

Expenses $(1,00,000 \times 1.75) = 1,75,000$

Calculation of Cash $= \underline{8,75,000}$

Working capital before Cash $= 2,17,013$

$1/3$ of 2,17,013 $= 72,338$

5. Explain the term Working Capital. Compute working capital requirements from the following:

- (a) Proportion of cost to selling price: Material 50%, Labour 20% and overheads 10%.
Production in 1990 was 3,00,000 units and it is proposed to maintain the same in 1991.
- (b) Raw material remains in store for an average period of one month before issue to production.
- (c) Finished goods remain in store for two months before sale.
- (d) Each unit of production will be in manufacturing process for one month.
- (e) Credit allowed for one month by suppliers of material.
- (f) Debtors are allowed two months credit.
- (g) Selling price per unit is ₹9.

Sol. Computation of Working Capital Requirement

| Particulars | (₹) |
|---|-----------------|
| Current Asset | |
| Raw Material $\left(3,00,000 \times 9 \times 50\% \times \frac{1}{12}\right)$ | 1,12,500 |
| Finished Stock: Material 50% Labour 20% Overhead 10% | |
| $\left(3,00,000 \times 9 \times 80\% \times \frac{2}{12}\right)$ | 3,60,000 |
| Work-in-Progress: | |
| Material $3,00,000 \times 9 \times 50\% \times \frac{1}{12} \times 100\%$ | 1,12,500 |
| Labour $3,00,000 \times 9 \times 20\% \times \frac{1}{12} \times 100\%$ | 45,000 |
| Overhead $3,00,000 \times 9 \times 10\% \times \frac{1}{12} \times 100\%$ | <u>22,500</u> |
| Debtors: | |
| $\left(3,00,000 \times 9 \times 80\% \times \frac{2}{12}\right)$ | <u>3,60,000</u> |
| Total Current Amount | 10,12,500 |
| Current Liabilities: | |
| Creditors $\left(3,00,000 \times 9 \times 50\% \times \frac{1}{12}\right)$ | 1,12,500 |
| Working Capital Required | 90,000 |

Assumed that work-in-progress is 100% complete with regard to material, labour and overhead.

6. From the following information, estimate the net working capital:

| Particulars | Cost per unit (₹) |
|---------------|----------------------|
| Raw Material | 400 |
| Direct Labour | 150 |
| Overheads | 300 |
| Total Cost | 850 |

Additional Informations:

Selling Price ₹1,000 per unit; Output 52,000 units per annum; Raw material in Stock —average 4 weeks; Stock of work-in-progress (Assume 50% completion stage with full material consumption)— Average 2 weeks; Finished goods in stock — average 4 weeks, credit allowed by suppliers — average 4 weeks, Credit allowed to Debtors — average 8 weeks; Cash at bank is expected to be ₹50,000.

Assume that production is sustained at an even pace during the 52 weeks of the year. All sales are on credit basis.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|---|-------------|
| Raw Material $\left(2,08,00,000 \times \frac{4}{52}\right)$ | 16,00,000 |
| Work-in-Progress $\left(\begin{array}{l} 2,08,00,000 \times \frac{2}{52} \times 100\% \\ 78,00,000 \times \frac{2}{52} \times 50\% \\ 1,56,00,000 \times \frac{2}{52} \times 50\% \end{array}\right)$ | 8,00,000 |
| | 1,50,000 |
| | 3,00,000 |
| Finished goods $\left(4,42,00,000 \times \frac{4}{52}\right)$ | 34,00,000 |
| Debtors $\left(4,42,00,000 \times \frac{8}{52}\right)$ | 68,00,000 |
| Cash at Bank | 50,000 |
| | 1,31,00,000 |
| Less: Current Liabilities | |
| Creditors $\left(2,08,00,000 \times \frac{4}{52}\right)$ | 16,00,000 |
| Working Capital | 1,15,00,000 |

Working Note:

1. Raw Material = $52,000 \times 400 = 2,08,00,000$
2. Direct Labour = $52,000 \times 150 = 78,00,000$
3. Overheads = $52,000 \times 300 = 1,56,00,000$
4,42,00,000

7. Rama Ltd. manufacturers product 'A' and proforma cost sheet of it is as under:

| Particulars | Per Unit (₹) |
|---------------|-----------------|
| Raw Material | 160 |
| Direct Labour | 60 |
| Overheads | <u>120</u> |
| Total cost | 340 |
| Profit | <u>60</u> |
| Selling price | 400 |

Additional information:

- (a) Raw material are in stock on average for one month.
- (b) Work-in-progress on average half a month.
- (c) Finished goods are in stock on average for one month.
- (d) Credit allowed by suppliers is one month and that allowed to customers is two months.
- (e) Lag in payment of wages is $1\frac{1}{2}$ weeks and in payment of overheads is one month.

(f) $\frac{1}{4}$ part of output is sold against cash.

(g) Cash in hand is estimated to be ₹50,000.

Assuming a level of activity producing 52,000 units, prepare an estimate of working capital requirements.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|------------------|
| Current Assets | |
| Raw Material = $\left(83,20,000 \times \frac{4}{52}\right)$ | 6,40,000 |
| Work-in-Progress $\left(176,80,000 \times \frac{2}{52}\right)$ | 6,80,000 |
| Finished goods $\left(176,80,000 \times \frac{4}{52}\right)$ | 13,60,000 |
| Debtors $\left(176,80,000 \times \frac{8}{52} \times \frac{3}{4}\right)$ | 20,40,000 |
| Cash in hand | 50,000 |
| Less: Current Liabilities | |
| Creditors $\left(83,20,000 \times \frac{4}{52}\right)$ | 6,40,000 |
| Outstanding Wages $\left(31,20,000 \times \frac{1.5}{52}\right)$ | 90,000 |
| Outstanding Overheads $\left(62,40,000 \times \frac{4}{52}\right)$ | 4,80,000 |
| Working Capital | 35,60,000 |

Working Note:

1. Raw Material = $52,000 \times 160 = 83,20,000$

2. Labour = $52,000 \times 60 = 31,20,000$

3. Overheads = $52,000 \times 120 = \underline{62,40,000}$
1,76,80,000

8. Using Operating Cycle method, calculated working capital required by X Ltd. from the information given below:

(a) Estimated sales 20,000 units p.a. @ ₹5 per unit.

(b) Production and sales quantities coincide and will be carried throughout the year.

(c) Production cost is estimated as under:

Material ₹2.50 per unit.

Labour ₹1.00 per unit. Overheads ₹17,500

(d) Customers are given 60 days credit and 50 days credit availed from suppliers.

(e) 40 days supply of raw materials and 15 days supply of finished goods are kept in store.

(f) Production cycle is 20 days and all materials are issued at the commencement of each production cycle.

(g) $\frac{1}{3}$ of Average other working capital is kept as cash balance for contingencies.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|--------|
| Current Assets | |
| Raw Material $\left(50,000 \times \frac{40}{360}\right)$ | 5,556 |
| Work-in-Progress $\left(87,500 \times \frac{20}{360}\right)$ | 4,861 |
| Finished goods $\left(87,500 \times \frac{15}{360}\right)$ | 3,646 |
| Debtors $\left(87,500 \times \frac{60}{360}\right)$ | 14,583 |
| Cash | 7,234 |
| Less: Current Liabilities | |
| Creditors $\left(50,000 \times \frac{50}{360}\right)$ | 6,944 |
| Working Capital | 28,936 |

Working Note:

1. Raw Material = $20,000 \times 2.50 = 50,000$ 2. Labour = $20,000 \times 1 = 20,000$
 3. Overheads = 17,500

Calculation of Cash = $\frac{1}{3}$ of 21,702 = 7,234

9. 'X' Ltd. is interested to purchase a business and has consulted you and one point on which you are asked to advise them is the average amount of working capital which will be required in the first year's working.

Following is the detail of information for the purpose of your workings:

| | | Figures for the year |
|-------|--|----------------------|
| | Particulars | (₹) |
| (i) | Amount blocked up for stocks: | |
| | Stocks of finished goods | 5,000 |
| | Stocks of stores, materials, etc. | 8,000 |
| (ii) | Average credit given: | |
| | Inland sales—6 weeks credit | 3,12,000 |
| | Export sales— $1\frac{1}{2}$ weeks credit | 78,000 |
| (iii) | Lag in payment of wages and other expenses: | |
| | Wages— $1\frac{1}{2}$ weeks | 2,60,000 |
| | Stocks, materials, etc. $1\frac{1}{2}$ months | 48,000 |
| | Rent, Royalties, etc. 6 months | 10,000 |
| | Clerical staff— $\frac{1}{2}$ month | 62,400 |
| | Manager $\frac{1}{2}$ month | 4,800 |
| | Miscellaneous Expenses $1\frac{1}{2}$ months | 48,000 |
| (iv) | Payment in Advance: | |
| | Sundry Expenses (paid quarterly in advance) | 8,000 |
| (v) | Undrawn profit on an average throughout the year | 11,000 |

Add 10% to your computed figure to allow for contingencies.

Calculate average amount of net working capital required.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|---------------|
| Current Asset | |
| Stock of finished goods | 5,000 |
| Stock of stores, materials, etc. | 8,000 |
| Debtors | |
| Inland sale $\left(3,12,000 \times \frac{6}{52} \right)$ | 36,000 |
| Export sales $\left(78,000 \times \frac{1.5}{52} \right)$ | 2,250 |
| Sundry expenses $\left(8,000 \times \frac{1}{4} \right)$ | 2,000 |
| Current Liabilities | 53,250 |
| Creditors $\left(48,000 \times \frac{1.5}{12} \right)$ | 6,000 |
| Outstanding Wages $\left(2,60,000 \times \frac{1.5}{52} \right)$ | 7,500 |
| Outstanding Rent, Royalty $\left(10,000 \times \frac{6}{12} \right)$ | 5,000 |
| Outstanding Clerical Staff's Wages $\left(62,400 \times \frac{.5}{12} \right)$ | 2,600 |
| Outstanding Manager's Wages $\left(4,800 \times \frac{.5}{12} \right)$ | 200 |
| Outstanding Miscellaneous Expenses $\left(48,000 \times \frac{1.5}{12} \right)$ | 60,000 |
| | 25,950 |
| Add: Provision for contingencies | 2,595 |
| Working Capital | 28,545 |

10. The Management of Baby Care Ltd. has called for a statement showing, the working capital needed to finance a level of activity of 3,00,000 units of output for the year. Cost structure for the Co's product for the above mentioned activity level, is detailed below:

| Particulars | (₹) |
|---------------|-----------|
| Cost per unit | |
| Raw material | 20 |
| Direct labour | 05 |
| Overheads | 15 |
| | <u>40</u> |
| Total | 40 |
| Profit | 10 |
| Selling Price | 50 |

- (a) Raw Materials are held in stock, on an average, for two months.
 (b) Finished goods remain in warehouse, on an average for a month.

- (c) Work in Progress (100% completed in regard to materials and 50% for labour and overheads) will approximately to be half a month's production.
- (d) Supplier of materials give a month's credit.
- (e) Two months credit is allowed to Debtors. Calculation of debtors may be made at selling price.
- (f) A minimum cash balance of ₹25,000 is expected to be maintained.
- (g) Prepare a statement of working capital requirements.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|---|------------------|
| Current Assets | |
| Raw Material $\left(60,00,000 \times \frac{2}{12}\right)$ | 10,00,000 |
| Work-in-Progress $\left(60,00,000 \times \frac{0.5}{12} \times 100\% \right)$ $\left(15,00,000 \times \frac{0.5}{12} \times 50\% \right)$ $\left(45,00,000 \times \frac{0.5}{12} \times 50\% \right)$ | 3,75,000 |
| Finished goods $\left(120,00,000 \times \frac{1}{12}\right)$ | 10,00,000 |
| Debtors $\left(150,00,000 \times \frac{2}{12}\right)$ | 25,00,000 |
| Cash | 25,000 |
| Current Liabilities | |
| Creditors $\left(60,00,000 \times \frac{1}{12}\right)$ | 5,00,000 |
| Working Capital | 44,00,000 |

Working Note:

- Raw Material = $3,00,000 \times 20 = 60,00,000$
- Labour = $3,00,000 \times 5 = 15,00,000$
- Overheads = $3,00,000 \times 15 = \underline{45,00,000}$
 $= \underline{1,20,00,000}$
- Sale = $3,00,000 \times 50 = 1,50,00,000$

11. The Board of Directors of Hissar Auto Ltd. ask you to prepare a statement showing working capital estimates for a level of Activity of 15,600 units of production. The following information is available for your calculation:

(a) Per Unit Cost and Selling Price:

| | (₹) |
|---------------|------------|
| Raw Materials | 90 |
| Labour | 40 |
| Overheads | 75 |
| | <u>205</u> |
| Profit | 60 |
| Selling Price | <u>265</u> |

- (b) (i) Raw materials are in stock average for one month.
 (ii) Materials are in process on average for two weeks.
 (iii) Finished goods are in stock on average for one month.
 (iv) Credit allowed by suppliers one month.
 (v) Credit allowed to debtors two months.
 (vi) Lag in payment of wages $1\frac{1}{2}$ weeks.
 (vii) Lag in payment of overheads is one month.

20% of production is sold against cash. Cash in hand is expected to be ₹60,000. It is to be assumed that production is carried on evenly throughout the year, wages and overheads accrue similarly and time period of 4 weeks is equivalent to one month.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|-----------------|
| Current Assets | |
| Raw Material $\left(14,04,000 \times \frac{4}{52}\right)$ | 1,08,000 |
| Work-in-Progress $\left(3,198,000 \times \frac{2}{52}\right)$ | 1,23,000 |
| Finished goods $\left(3,198,000 \times \frac{4}{52}\right)$ | 2,46,000 |
| Debtors $\left(3,198,000 \times 80\% \times \frac{8}{52}\right)$ | 39,36,000 |
| Cash in hand | 60,000 |
| Current Liabilities | |
| Creditors $\left(14,04,000 \times \frac{4}{52}\right)$ | 1,08,000 |
| Outstanding Wages $\left(6,24,000 \times \frac{15}{52}\right)$ | 18,000 |
| Outstanding Overheads $\left(11,70,000 \times \frac{4}{52}\right)$ | 9,000 |
| Working Capital | 7,14,600 |

Working Note:

- Raw Material = $1,56,000 \times 90 = 14,04,000$
- Labour = $1,56,000 \times 40 = 6,24,000$
- Overheads = $1,56,000 \times 75 = \underline{11,70,000}$
 $= \underline{31,98,000}$

12. From the following information prepare statement showing working capital required by a company.

Level of production per month 20,000 units.

Selling price per unit ₹20.

Margin on Sales 10%

Expected ratios of cost to selling price:

(a) Raw materials 55%. (b) Direct Labour 20%. (c) Overheads 15%.

Raw material required in stock 2 months.

Finished goods in stock on an average 2 months.

Processing Period (Production is carried out evenly throughout the year) 1 Month.

recovery from customers after 1 month.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|---|------------------|
| Current Assets | |
| Raw Material = $\left(26,40,000 \times \frac{2}{12}\right)$ | 4,40,000 |
| Work-in-Progress $\left(43,20,000 \times \frac{1}{12}\right)$ | 3,60,000 |
| Finished goods $\left(43,20,000 \times \frac{2}{12}\right)$ | 7,20,000 |
| Debtors $\left(43,20,000 \times \frac{1}{12}\right)$ | 3,60,000 |
| Working Capital | 18,80,000 |

Working Note:

$$\text{Units} = 20,000 \times 12 = 2,40,000$$

$$\text{Sale} = 2,40,000 \times 20 = 48,00,000$$

$$1. \text{ Raw Material} = 55\% \text{ of } 48,00,000 = 26,40,000$$

$$2. \text{ Direct Labour } 20\% \text{ of } 48,00,000 = 9,60,000$$

$$3. \text{ Overheads } 15\% \text{ of } 48,00,000 = \underline{7,20,000}$$

$$\underline{43,20,000}$$

13. Ashok Ltd. sells goods in the domestic market at a gross profit of 25% not counting depreciation as part of the cost of goods sold. Its annual figures are as under:

| Particulars | (₹) |
|---|-----------|
| Sales—Home at one month's credit | 12,00,000 |
| Sales—Export at three months' credit (Sale price 10% below home price) | 5,40,000 |
| Materials used (Supplies extend two month's credit) | 4,50,000 |
| Wages Paid $\frac{1}{2}$ month in arrear | 3,60,000 |
| Manufacturing Expenses (Cash) Paid (One month in arrear) | 5,40,000 |
| Adm. expenses paid one month's arrear | 1,20,000 |
| Sales promotion expenses payable (quarterly paid in advance) | 60,000 |
| Income tax payable in four instalments of which one falls in the next financial year | 1,50,000 |

The company keeps one month's stock at each of raw materials and finished goods and believes in keeping ₹ 1,00,000 available to it including the overdraft limit of ₹ 50,000 not yet utilised by the company. Assuming a 15% margin, ascertain the requirements of the Working Capital of the Company. Ignore Work-in-progress.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|----------|
| Current Assets | |
| Raw Material $\left(4,50,000 \times \frac{1}{12}\right)$ | 37,500 |
| Finished goods $\left(13,50,000 \times \frac{1}{12}\right)$ | 1,12,500 |
| Debtors Home $\left(9,00,000 \times \frac{1}{12}\right)$ | 75,000 |
| Export $\left(4,50,000 \times \frac{3}{12}\right)$ | 1,12,500 |
| Sale promotion expenses $\left(60,000 \times \frac{1}{4}\right)$ | 15,000 |
| Cash | 1,00,000 |
| Current Liabilities | |
| Creditors $\left(4,50,000 \times \frac{2}{12}\right)$ | 75,000 |
| Outstanding Wages $\left(3,60,000 \times \frac{0.5}{12}\right)$ | 15,000 |
| Outstanding Manufacturing Expenses $\left(5,40,000 \times \frac{1}{12}\right)$ | 45,000 |
| Outstanding Admn. Expenses $\left(120,000 \times \frac{1}{12}\right)$ | 10,000 |
| Overdraft | 50,000 |
| | 2,57,500 |
| Add: Margin @15% | 38,625 |
| | 2,96,125 |

Working Note:

1. Finished goods calculated at cost

$$\begin{aligned}
 &= \text{Material} + \text{Wages} + \text{Manufacturing Expenses} \\
 &= 4,50,000 + 3,60,000 + 5,40,000 \\
 &= 13,50,000
 \end{aligned}$$

2. Debtors - Home

$$\begin{aligned}
 12,00,000 \times 25\% &= 3,00,000 \\
 12,00,000 - 3,00,000 &= 9,00,000
 \end{aligned}$$

3. Cost of goods sold for export sale

$$\text{Let price for domestic sale} = 100 [100 - 25 = 75]$$

$$\text{Price for export sale} = 90$$

$$\text{Profit} = 15 \frac{5,40,000}{90} \times 75$$

$$\text{Cost} = \overline{75} = 4,50,000$$

14. On 1st January of the year, the Managing Director of A Ltd. wanted to know the amount of working capital that will be required during the year.

From the following information prepare the forecast of working capital requirements:

Production in the last year was 60,000 units. The same will be the production this year.

Estimated ratios of different costs to selling prices are:

| | |
|---------------|-----|
| Raw Materials | 60% |
| Direct Wages | 10% |
| Overheads | 20% |

Raw materials will remain in store, on an average, for two months, before issued for production.

Each unit will be in production process for 1 month, the raw materials being fed into pipeline immediately. The labour and overhead costs will occur evenly during the period.

Finished goods will stay in the warehouse for approximately 3 months.

Credit allowed to by creditors is 2 months from the date of delivery of raw materials.

Credit allowed to debtors is 3 months from the date of despatch.

There are regular production and sales cycles. Wages are paid on 1st day of a month. The company keeps normally ₹20,000 as cash in hand, selling price is ₹5 per unit.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|---|-----------------|
| Current Assets | |
| Raw Material $\left(180,000 \times \frac{2}{12}\right)$ | 30,000 |
| Work-in-Process $\left(2,70,000 \times \frac{1}{12}\right)$ | 22,500 |
| Finished goods $\left(2,70,000 \times \frac{3}{12}\right)$ | 67,500 |
| Debtors $\left(2,70,000 \times \frac{3}{12}\right)$ | 67,500 |
| Cash | 20,000 |
| Current Liabilities | |
| Creditors $\left(180,000 \times \frac{2}{12}\right)$ | 30,000 |
| Outstanding Wages $\left(30,000 \times \frac{1}{12}\right)$ | 2,500 |
| Working Capital | 1,75,000 |

Working Note:

$$\text{Units} = 60,000$$

$$\text{Sale} = 60,000 \times 5$$

$$= 3,00,000$$

$$1. \text{ Raw Material} = 3,00,000 \times 60\% = 1,80,000$$

$$2. \text{ Direct Labour} = 3,00,000 \times 10\% = 30,000$$

$$3. \text{ Overheads} = 3,00,000 \times 20\% = \frac{60,000}{2,70,000}$$

15. The following annual figures related to XYZ Co.:

| Particulars | (₹) |
|---|-----------|
| Sales (at two month's credit) | 36,00,000 |
| Materials consumed (suppliers extent 2 month's credit) | 9,00,000 |
| Wages paid (monthly in arrear) | 7,20,000 |
| Manufacturing expenses outstanding at the end of the year (Cash expenses are paid one month in arrear) | 80,000 |
| Total Administrative expenses, paid as above | 2,40,000 |
| Sales Promotion expenses, paid quarterly in advance | 1,20,000 |

The company sells its products on gross profit of 25% counting depreciation as part of the cost of production. It keeps one month's stock each of raw materials and finished goods, and a cash balance of ₹ 1.00 lac.

Assuming a 20% safety margin, work out the working capital requirements of the company on cash cost basis. Ignore work-in-progress.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|---|----------|
| Current Assets | |
| Raw Material $\left(9,00,000 \times \frac{1}{12}\right)$ | 75,000 |
| Finished goods $\left(25,80,000 \times \frac{1}{12}\right)$ | 2,15,000 |
| Debtors $\left(29,40,000 \times \frac{2}{12}\right)$ | 4,90,000 |
| Cash Balance | 1,00,000 |
| Sale promotion expenses paid in advance $\left(120,000 \times \frac{1}{4}\right)$ | 30,000 |
| Current Liabilities | |
| Creditors $\left(9,00,000 \times \frac{2}{12}\right)$ | 1,50,000 |
| Outstanding Wages $\left(7,20,000 \times \frac{1}{12}\right)$ | 60,000 |
| Outstanding Manufacturing Expenses | 80,000 |
| Outstanding Administrative Expense $\left(2,40,000 \times \frac{1}{12}\right)$ | 20,000 |
| | 6,00,000 |
| Add: Safety Margin @20% | 1,20,000 |
| | 7,20,000 |

16. Weekly sales of a product are 4000 units @ ₹ 3 a unit. Six weeks credit is given. Unit cost is as follows:

| Particulars | (₹) |
|-----------------|----------------|
| Direct Material | 1.25 |
| Direct Labour | 0.50 |
| Overhead | 4,000 per week |

Planned stock includes ₹25,000 raw material and 20,000 units of finished products. Creditors are paid end of the month following delivery overhead after 4 weeks of expenses. Wages are paid every week end. Work-in-progress is 2 weeks. Prepare working capital budget.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|--------|
| Current Assets | |
| Raw Material | 25,000 |
| Finished goods | 20,000 |
| Debtors $\left(5,72,000 \times \frac{6}{52}\right)$ | 66,000 |
| Work-in-Process $\left(5,72,000 \times \frac{2}{52}\right)$ | 22,000 |
| Current Liabilities | |
| Creditors $\left(2,60,000 \times \frac{4}{52}\right)$ | 20,000 |
| Outstanding Overhead $\left(2,08,000 \times \frac{4}{52}\right)$ | 16,000 |
| Outstanding Wages $\left(1,04,000 \times \frac{1}{52}\right)$ | 2,000 |
| Working Capital | 95,000 |

Working Note:

$$\text{Units} = 4,000 \times 52 = 2,08,000 \text{ units}$$

$$1. \text{ Direct Material} = 2,08,000 \times 1.25 = 2,60,000$$

$$2. \text{ Direct Labour} = 2,08,000 \times 0.50 = 1,04,000$$

$$3. \text{ Overheads} = 4,000 \times 52 = 2,08,000$$

17. The following information has been submitted by borrower:

| | |
|---|----------------|
| (i) Expected level of production | 1,20,000 units |
| (ii) Raw materials to remain in stock | 2 months |
| (iii) Processing period for each unit of product | 1 month |
| (iv) Finished goods remain in stock on an average | 3 months |
| (v) Credit allowed to the customers from the date of despatch | 3 months |
| (vi) Expected rate of cost to selling price | |
| (a) Raw materials 60% | |
| (b) Direct wages 10% | |
| (c) Overheads 20% | |
| (vii) Selling price per unit ₹ 10 | |
| (viii) Expected margin on sale 10% | |

You are required to estimate the working capital requirements of the borrower adopting a suitable method.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|----------|
| Current Assets | |
| Raw Material $\left(7,20,000 \times \frac{2}{12}\right)$ | 1,20,000 |
| Work-in-Process $\left(10,80,000 \times \frac{1}{12}\right)$ | 90,000 |
| Finished goods $\left(10,80,000 \times \frac{3}{12}\right)$ | 2,70,000 |
| Debtors $\left(10,80,000 \times \frac{3}{12}\right)$ | 2,70,000 |
| Working Capital | 7,50,000 |

Working Note:

$$\text{Sale} = 12,00,000 \times 10 = 12,00,000$$

$$1. \text{ Raw Material} = 12,00,000 \times 60\% = 7,20,000$$

$$2. \text{ Direct Wages} = 12,00,000 \times 10\% = 1,20,000$$

$$3. \text{ Overheads} = 12,00,000 \times 20\% = 2,40,000$$

$$\underline{10,80,000}$$

18. From the following details, prepare an estimate of working capital requirements.

| | |
|-----------------------------|-----------------------|
| Production | 60,000 units |
| Selling price per unit | ₹ 5 |
| Raw materials | 60% of selling price |
| Direct wages | 10% of selling price |
| Overheads | 20% of selling price |
| Materials in hand | 2 months requirements |
| Production time | 1 month |
| Finished goods in stores | 3 months |
| Credit for material | 2 months |
| Credit allowed to customers | 3 months |
| Average cash balance | ₹ 20,000 |

Wages and overheads are paid at the beginning of the month following. In production, all the required materials are charged in the initial stage and wages and overheads accrue evenly.

Sol.

| Calculation of Working Capital | (₹) |
|---|--------|
| Current Assets | |
| Raw Material $\left(180,000 \times \frac{2}{12}\right)$ | 30,000 |
| Work-in-Process $\left(2,70,000 \times \frac{1}{12}\right)$ | 22,500 |
| Finished goods $\left(2,70,000 \times \frac{3}{12}\right)$ | 67,500 |
| Debtors $\left(2,70,000 \times \frac{3}{12}\right)$ | 67,500 |
| Cash | 20,000 |

| | |
|---|----------|
| Less: Current Liabilities | |
| Outstanding Wages $\left(30,000 \times \frac{1}{12}\right)$ | 2,500 |
| Outstanding Overheads $\left(60,000 \times \frac{1}{12}\right)$ | 5,000 |
| Creditors $\left(180,000 \times \frac{2}{12}\right)$ | 30,000 |
| Working Capital | 1,70,000 |

Working Note:

$$\text{Sale} = 60,000 \times 5 = 3,00,000$$

$$1. \text{ Raw Material} = 3,00,000 \times 60\% = 1,80,000$$

$$2. \text{ Direct Wages} = 3,00,000 \times 10\% = 30,000$$

$$3. \text{ Overheads} = 3,00,000 \times 20\% = 60,000$$

$$\underline{2,70,000}$$

19. From the following information, calculate the average amount of net working capital required, allowing 10% for contingencies:

| | Particulars | Per Annum (₹) |
|-------|---|---------------|
| (i) | Average amount of stock to be maintained: | 30,000 |
| | Stock of finished product: | 45,000 |
| | Stock of raw materials and stores: | |
| (ii) | Credit allowed to customers: | |
| | Inland Sales: 8 weeks | 7,80,000 |
| | Export Sales: $1\frac{1}{2}$ weeks | 2,65,200 |
| (iii) | Lag in payment of expenses: | |
| | Wages: 2 weeks | 5,85,000 |
| | Stores and Materials: one months | 1,44,000 |
| | Rent and Royalties: four months | 48,000 |
| | Office Salaries: $1\frac{1}{2}$ weeks | 3,27,600 |
| | Manager's Salary: $\frac{1}{2}$ months | 16,800 |
| | Other expenses: 6 weeks | 1,66,400 |
| (iv) | Payment in advance: | |
| | Sundry expenses (paid quarterly in advance) | 32,000 |

Sol. Calculation of Working Capital

| Particulars | (₹) |
|----------------------------------|--------|
| Current Assets | |
| Stock of finished product | 30,000 |
| Stock of Raw Material and stores | 45,000 |

| | |
|--|----------|
| Debtors - Inland Sales $\left(7,80,000 \times \frac{8}{52}\right)$ | 1,20,000 |
| - Export Sales $\left(2,65,200 \times \frac{1.5}{52}\right)$ | 7,650 |
| Sundry Expenses paid in advance = $\left(32,000 \times \frac{1}{4}\right)$ | 8,000 |
| Current Liabilities | |
| Outstanding Wages $\left(5,85,000 \times \frac{2}{52}\right)$ | 22,500 |
| Stores and Material $\left(144,000 \times \frac{1}{12}\right)$ | 12,000 |
| Rent and Royalty $\left(48,000 \times \frac{4}{12}\right)$ | 16,000 |
| Office Salary $\left(3,27,600 \times \frac{15}{52}\right)$ | 9,450 |
| Manager's Salary $\left(16,800 \times \frac{0.5}{12}\right)$ | 700 |
| Other Expenses $\left(166,400 \times \frac{6}{52}\right)$ | 19,200 |
| | 1,30,800 |
| Add: 10% Provision for contingencies | 13,080 |
| | 1,43,880 |

20. The Sept. Company Ltd. has the following selected assets and liabilities:

| Particulars | (₹) |
|--|----------|
| Cash | 45,000 |
| Retained Earnings | 1,60,000 |
| Equity Share Capital | 1,50,000 |
| Debtors | 60,000 |
| Inventory | 1,11,000 |
| Debenture | 1,00,000 |
| Provision for Taxation | 57,000 |
| Expenses outstanding | 21,000 |
| Land and Building | 3,00,000 |
| Goodwill | 50,000 |
| Furniture | 25,000 |
| Long-term Bank Loans due for payment in the next month | 1,20,000 |
| Cash Credit Limit fixed by Bank for next five years | 5,00,000 |
| Creditors | 39,000 |

You are required to determine: (i) Gross working capital (ii) Net working capital

Sol. Calculation of Gross Working Capital

| Particulars | (₹) |
|---|--|
| Total Current Assets | |
| Cash | 45,000 |
| Debtors | 60,000 |
| Inventory | 1,11,000 |
| | <u>2,16,000</u> |
| (ii) Calculation of Net Working Capital | = Current Assets – Current Liabilities |
| | = 2,16,000 – 2,37,000 |
| | = (–) 21,000 |
| Current Liabilities | |
| Provision for taxation | = 57,000 |
| Outstanding Expenses | = 21,000 |
| Long Term Bank Loan due for payment in next month | 1,20,000 |
| Creditors | <u>39,000</u> |
| | <u>2,37,000</u> |

21. From the following particulars, prepare an estimate of working capital requirement of a trading concern:

| Particulars | (₹) |
|---|----------------|
| (i) Projected Annual Sales | 1,00,000 units |
| (ii) Selling Price: | ₹ 8 per unit. |
| (iii) % of net Profit on Sales: | 25% |
| (iv) Average credit period allowed to customers: | 8 weeks |
| (v) Average credit period allowed by suppliers: | 8 weeks |
| (vi) Average stock holding in terms of sales requirement: | 12 weeks |
| (vii) Allow 10% for contingencies. | |

Sol. Calculation of Working Capital

| Particulars | (₹) |
|---|-------------------|
| Current Assets | |
| Debtors $\left(6,00,000 \times \frac{8}{52}\right)$ | 92,308 |
| Stock $\left(6,00,000 \times \frac{12}{52}\right)$ | 1,38,462 |
| Current Liabilities | |
| Creditors $\left(6,00,000 \times \frac{8}{52}\right)$ | 92,308 |
| | <u>1,38,462</u> |
| Add: 10% for contingencies | 13,846.2 |
| | <u>1,52,308.2</u> |

Working Note:

$$\text{Sale} = 1,00,000 \times 8 = 8,00,000$$

$$\begin{aligned} \text{COGs} &= 8,00,000 - 25\% \text{ of } 8,00,000 \\ &= 6,00,000 \end{aligned}$$

22. Using the following particulars, determine the working capital required by XYZ Co.

(per year in ₹)

| Particulars | (₹) |
|---|----------|
| (i) Average amount locked up in stocks: | |
| Stock of raw material | 20,000 |
| Work-in-progress | 4,000 |
| Stock of F.G. | 30,000 |
| (ii) Average Credit given: | |
| Home market: 2 weeks credit | 2,60,000 |
| Foreign market: 6 weeks credit | 6,24,000 |
| (iii) Time available for payments: | |
| For purchases – 4 weeks | 1,56,000 |
| For wages — 2 weeks | 2,08,000 |
| For Mfg. expenses – 1 week | 78,000 |

You may add 10% to allow for contingencies.

Sol. Calculation of Working Capital

| Particulars | (₹) |
|--|----------|
| Current Assets | |
| Raw Material | 20,000 |
| Work-in-Progress | 4,000 |
| Finished goods | 30,000 |
| Debtors - Home Market $\left(2,60,000 \times \frac{2}{52}\right)$ | 10,000 |
| Foreign Market $\left(6,24,000 \times \frac{6}{52}\right)$ | 72,000 |
| Current Liabilities | |
| Creditors $\left(1,56,000 \times \frac{4}{52}\right)$ | 12,000 |
| Outstanding Wages $\left(2,08,000 \times \frac{2}{52}\right)$ | 8,000 |
| Outstanding Manufacturing Expenses $\left(78,000 \times \frac{1}{52}\right)$ | 1,500 |
| | 1,14,500 |
| Add: 10% for contingencies | 11,450 |
| | 1,25,950 |



9

Dividend Policy

1. Shashwat Ltd. had 50,000 equity shares of ₹10 each outstanding on January 1. The shares are currently being quoted at par the market. In the wake of the removal of dividend restraint, the company now intends to pay a dividend of ₹2 per share for the current calendar year. It belongs to a risk-class whose appropriate capitalisation rate is 15%. Using MM model and assuming no taxes, ascertain the price of the company's share as it is likely to prevail at the end of the year (i) when dividend is declared, and (ii) when no dividend is declared. (iii) Also find out the number of new equity shares that the company must issue to meet its investment needs of ₹2 lakhs, assuming a net income of ₹1.1 lakhs and also assuming that the dividend is paid.

Sol. (i) Price per share when dividends are paid

$$P_0 = \frac{D_1 + P_1}{1 + K_e}$$

$$10 = \frac{2 + P_1}{1 + 15\%}$$

$$10 + 1.5 = 2 + P_1$$

$$P_1 = 9.5$$

(ii) Price per share when dividends are not paid

$$P_0 = \frac{D_1 + P_1}{1 + K_e}$$

$$10 = \frac{0 + P_1}{1 + 15\%}$$

$$10 + 1.5 = P_1$$

$$P_1 = 11.5$$

(iii) Number of new equity shares to be issued if dividend is paid

$$\Delta_n = \frac{I - (E - nD_1)}{P_1}$$

$$= \frac{2,00,000 - (1,10,000 - 50,000 \times 2)}{9.5}$$

$$= 20,000 \text{ Shares}$$

2. Ridhan Company has a cost of equity capital of 10%, the current value of firm is ₹20,00,000 @ ₹20 per share. Company is planning new investment worth ₹6,80,000. Earning of company is ₹1,50,000 and company is paying dividend @ ₹1 per share. Show under MM assumption, the payment of dividend does not affect value of firm.

Sol. Value of the firm when dividends are paid:

- (i) Price of the share at the end of current financial year:

$$P_0 = \frac{D_1 + P_1}{1 + K_e}$$

$$20 = \frac{1 + P_1}{1 + 10}$$

$$20 + 2 = 1 + P_1$$

$$P_1 = 21$$

- (ii) No. of shares to be issued:

$$\begin{aligned} \Delta_n &= \frac{I - (E - nD_1)}{P_1} \\ &= \frac{6,80,000 - (1,50,000 - 1,00,000 \times 1)}{21} \\ &= \frac{6,80,000 - 50,000}{21} \\ &= \frac{6,30,000}{21} \text{ shares} \end{aligned}$$

- (iii) Value of firm

$$\begin{aligned} nP_0 &= \frac{(n + m)P_1 - (I - E)}{1 + K_e} \\ &= \frac{(1,00,000 + 6,30,000 / 21) 21 - (6,80,000 - 1,50,000)}{1 + 10} \\ &= \frac{21,00,000 + 6,30,000 - 5,30,000}{110} \\ &= ₹ 20,00,000 \end{aligned}$$

3. The MNC Ltd's available information is:

$K_e = 15\%$ $E = ₹30$ $r =$ (i) 14%, (ii) 15%, and (iii) 16%. You are required to calculate market price of a share of the MNC Ltd. as per Gordon Model if:

(i) $b = 40\%$, (ii) $b = 60\%$, and (iii) $b = 80\%$.

Sol. Dividend Policy and the Value of Shares

- | | | |
|----------------|-----------------|------------------|
| (i) $r = 14\%$ | (ii) $r = 15\%$ | (iii) $r = 16\%$ |
| ($r < K$) | ($r = K$) | ($r > K$) |

$$P = \frac{E(1-b)}{K_e - br}$$

(i) When $b = 40\%$

$$\begin{aligned} P &= \frac{30(1-.40)}{.15-.40 \times .14} \\ &= \frac{30-12}{.15-0.056} \\ &= \frac{18}{0.094} \\ &= 191.49 \end{aligned}$$

$$\begin{aligned} P &= \frac{30(1-.40)}{.15-.40 \times .15} \\ &= \frac{30-12}{.15-0.06} \\ &= \frac{18}{0.09} \\ &= 200 \end{aligned}$$

$$\begin{aligned} P &= \frac{30(1-.40)}{.15-.40 \times .16} \\ &= \frac{30-12}{.15-0.064} \\ &= \frac{18}{0.086} \\ &= 209.30 \end{aligned}$$

(ii) When $b = 60\%$

$$\begin{aligned} P &= \frac{30(1-.60)}{.15-.60 \times .14} \\ &= \frac{30-18}{0.066} \\ &= 181.82 \end{aligned}$$

$$\begin{aligned} P &= \frac{30(1-.60)}{.15-.60 \times .15} \\ &= \frac{30-18}{0.06} \\ &= 200 \end{aligned}$$

$$\begin{aligned} P &= \frac{30(1-.60)}{.15-.60 \times .16} \\ &= \frac{30-12}{0.054} \\ &= 222.22 \end{aligned}$$

(iii) When $b = 80\%$

$$\begin{aligned} P &= \frac{30(1-.80)}{.15-.80 \times .14} \\ &= \frac{30-24}{.15-0.112} \\ &= 157.89 \end{aligned}$$

$$\begin{aligned} P &= \frac{30(1-.60)}{.15-.60 \times .15} \\ &= \frac{30-24}{.15-0.12} \\ &= 200 \end{aligned}$$

$$\begin{aligned} P &= \frac{30(1-.60)}{.15-.60 \times .16} \\ &= \frac{30-24}{.15-0.128} \\ &= 272.73 \end{aligned}$$

4. The following information is available in respect of the rate of return on investment (r), the capitalisation rate (K_e) and earning per share of a company

$$r = 12\%$$

$$E = ₹20$$

Determine value of its shares by Gordon's Model, assuming the following:

| | D/P Ratio (1-b) | Retention Ratio (b) | K_e (%) |
|-----|-----------------|---------------------|-----------|
| (a) | 10 | 90 | 20 |
| (b) | 20 | 80 | 19 |
| (c) | 30 | 70 | 18 |
| (d) | 40 | 60 | 17 |
| (e) | 50 | 50 | 16 |
| (f) | 60 | 40 | 15 |
| (g) | 70 | 30 | 14 |

Sol.
$$P = \frac{E(1-b)}{K_e - br}$$

(a) D/P ratio = 10% b = 90% $K_e = .20$

$$P = \frac{20(1-.90)}{.20 - .90 \times .12}$$

$$= \frac{2}{.20 - 0.108}$$

$$= 21.74$$

(b) D/P ratio = 20% b = 80% $K_e = .19$

$$P = \frac{20(1-.80)}{.20 - .80 \times .12}$$

$$= \frac{4}{.19 - 0.096}$$

$$= 42.55$$

(c) D/P ratio = 30% b = 70% $K_e = .18$

$$P = \frac{20(1-.70)}{.18 - .70 \times .12}$$

$$= \frac{4}{.18 - 0.084}$$

$$= 62.50$$

(d) D/P ratio = 40% b = 60% $K_e = .17$

$$P = \frac{20(1-.60)}{.17 - .60 \times .12}$$

$$= \frac{8}{.17 - 0.072}$$

$$= 81.63$$

(e) D/P ratio = 50% b = 50% $K_e = .16$

$$P = \frac{20(1-.50)}{.16 - .50 \times .12}$$

$$= \frac{10}{.16 - 0.06}$$

$$= 100$$

(f) D/P ratio = 60% b = 40% $K_e = .15$

$$P = \frac{20(1-.40)}{.15 - .40 \times .12}$$

$$= \frac{12}{.15 - 0.048}$$

$$= 117.65$$

(g) D/P ratio = 70% b = 30% $K_e = .14$

$$P = \frac{20(1 - .30)}{.14 - .30 \times .12}$$

$$= \frac{14}{.14 - 0.036}$$

$$= 134.62$$

5. Sahu and Co. earns ₹6 per share having capitalization rate of 10% and has a return on investment at the rate of 20%. According to Walter's model, what should be the price per share at 30% dividend payout ratio? Is this the optimum payout ratio as per Walter?

$$(a) P = \frac{\frac{D + r(E - D)}{K_e}}{K_e} \quad \left[\begin{array}{l} D = \text{Earnings} \times D/P \\ = 6 \times 30\% \\ = 1.8 \end{array} \right]$$

$$= \frac{1.8 + \frac{.20(6 - 1.8)}{.10}}{.10}$$

$$= \frac{1.8 + 8.4}{.10}$$

$$= 102$$

(b) According to **Prof. Walter**, if $r > k$, i.e., if the firm earns a higher rate of return on its investment than the required rate of return, the firm should retain the earnings. Such firms are termed as growth firms and the optimum pay-out would be zero in this case. This would maximise the value of share. Hence, 30% pay-out is not optimum payout ratio.

6. X Co. earns ₹5 per share, is capitalised at a rate of 10% and has a rate of return on investment at 18%. According to Walter's model, what should be the price per share at 25% dividend payout ratio? Is this the optimum payout ratio according to Walter?

Sol.
$$(a) P = \frac{\frac{D + r(E - D)}{K_e}}{K_e} \quad D = [5 \times 25\%]$$

$$= \frac{1.25 + \frac{.18(5 - 1.25)}{.10}}{.10} = 1.25$$

$$= \frac{1.25 + 6.75}{.10}$$

$$= ₹80$$

(b) According to **Prof. Walter**, if $r > k$, i.e., if the firm earns a higher rate of return on its investment than the required rate of return, the firm should retain the earnings. Such firms are termed as growth firms and the optimum pay-out would be zero in this case. This would maximise the value of share. Hence, 25% pay-out is not optimum pay-out ratio.

7. Following are the details regarding three companies A Ltd., B Ltd. and C Ltd.:

| Details | A Ltd. | B Ltd. | C Ltd. |
|-------------------------|--------|--------|--------|
| Internal rate of return | 15% | 5% | 10% |
| Cost of equity capital | 10% | 10% | 10% |
| Earnings per share | ₹ 8 | ₹ 8 | ₹ 8 |

Calculate the value of an equity share of each of these companies applying Walter's formulae when dividend payout ratio (D/P) is:

(i) 50%,

(ii) 75%, and

(iii) 25%

$$\text{Sol. } P = \frac{D + r(E - D)}{K_e} \quad [D = \text{Earnings} \times D/P]$$

A Ltd.

B Ltd.

C Ltd.

(i) When D/P is 50%

$$P = \frac{4 + \cdot 15(8 - 4)}{\cdot 10} = ₹ 100$$

$$P = \frac{4 + 0.05(8 - 4)}{\cdot 10} = ₹ 60$$

$$P = \frac{4 + \cdot 10(8 - 4)}{\cdot 10} = ₹ 80$$

(ii) When D/P = 75%

$$P = \frac{6 + \cdot 15(8 - 6)}{\cdot 10} = ₹ 90$$

$$P = \frac{6 + 0.05(8 - 6)}{\cdot 10} = ₹ 70$$

$$P = \frac{6 + 0 \cdot 10(8 - 6)}{\frac{\cdot 10}{10}} = ₹ 80$$

(iii) When D/P is 25%

$$P = \frac{2 + \cdot 15(8 - 2)}{\cdot 10} = ₹ 110$$

$$P = \frac{2 + 0 \cdot 05(8 - 2)}{\cdot 10} = ₹ 50$$

$$P = \frac{2 + 0 \cdot 10(8 - 2)}{\cdot 10} = ₹ 80$$

8. Details regarding three companies are given below:

| A Ltd. | B Ltd. | C Ltd. |
|--------------|--------------|--------------|
| $r = 15\%$ | $r = 10\%$ | $r = 8\%$ |
| $K_e = 10\%$ | $K_e = 10\%$ | $K_e = 10\%$ |
| $E = ₹10$ | $E = ₹10$ | $E = ₹10$ |

By using Walter's model, you are required to:

(i) Calculate the value of an equity share of each of these companies when dividend payout ratio is:

(a) 20%, (b) 50%, (c) 0%, and (d) 100%

(ii) Comment on the results drawn.

$$\frac{D + r(E - D)}{K_e}$$

Sol. (i) $P = \frac{D + r(E - D)}{K_e}$

A Ltd.

B Ltd.

C Ltd.

(a) When D/P is 20%

$$P = \frac{2 + 0.15(10 - 2)}{0.10} = ₹ 140$$

$$P = \frac{2 + 0.10(10 - 2)}{0.10} = ₹ 100$$

$$P = \frac{2 + 0.08(10 - 2)}{0.10} = ₹ 84$$

(b) When D/P is 50%

$$P = \frac{5 + 0.15(10 - 5)}{0.10} = ₹ 125$$

$$P = \frac{5 + 0.10(10 - 5)}{0.10} = ₹ 100$$

$$P = \frac{5 + 0.08(10 - 5)}{0.10} = ₹ 90$$

(c) When D/P is 0%

$$P = \frac{0 + 0.15(10 - 0)}{0.10} = ₹ 150$$

$$P = \frac{0 + 0.10(10 - 0)}{0.10} = ₹ 100$$

$$P = \frac{0 + 0.08(10 - 0)}{0.10} = ₹ 80$$

(d) When D/P = 100%

$$P = \frac{10 + 0.15(10 - 10)}{0.10} = ₹ 100$$

$$P = \frac{10 + 0.10(10 - 10)}{0.10} = ₹ 100$$

$$P = \frac{10 + 0.08(10 - 10)}{0.10} = ₹ 100$$

(ii) (a) $r > K$, the company should retain the profits i.e. $r = 15\%$, $K_e = 10\%$

(b) $r = K$, i.e. $= 10\%$, the dividend pay-out does not affect the price of the share.

9. A Co. has the following details:

| | |
|----------------------------|-----|
| Earnings per share (E) | ₹10 |
| Dividend and per share (D) | ₹8 |
| Rate of return (r) | 10% |
| Cost of Capital (k_e) | 8% |

Using Walter's model, find out whether dividend payout ratio is optimum:

Sol.
$$P = \frac{D + r(E - D)}{K_e}$$

$$= \frac{8 + \frac{10(10 - 8)}{.08}}{.08}$$

$$= ₹131.25$$

(b) According to **Prof. Walter**, if $r > k$, i.e., if the firm earns a higher rate of return on its investment than the required rate of return, the firm should retain the earnings. Optimum pay-out would be zero. The pay-out ratio is not optimum.

10. Following information is available about a company:

$k_e = 16\%$, EPS = ₹20

Assume the rate of return on investments (r) = 20%, 12% and 16%. Show the effect of dividend policy on the market price of shares under Walter model by assuming 0%, 25%, 50%, 75% and 100% D/P ratios.

Sol.
$$P = \frac{D + r(E - D)}{K_e}$$

(i) if $r = 20\%$

(ii) $r = 12\%$

(iii) $r = 16\%$

(a) if D/P ratio is 0%

$$P = \frac{0 + .20(20 - 0)}{.16}$$

$$= ₹ 156.25$$

$$P = \frac{0 + .12(20 - 0)}{.16}$$

$$= ₹ 93.75$$

$$P = \frac{0 + .16(20 - 0)}{.16}$$

$$= ₹ 125$$

(b) if D/P ratio is 25%

$$P = \frac{5 + .20(20 - 5)}{.16}$$

$$= ₹ 148.43$$

$$P = \frac{5 + .12(20 - 5)}{.16}$$

$$= ₹ 101.56$$

$$P = \frac{5 + .16(20 - 5)}{.16}$$

$$= ₹ 125$$

(c) if D/P ratio is 50%

$$P = \frac{10 + .20(20 - 10)}{.16}$$

$$= ₹ 140.62$$

$$r = 20\%$$

$$P = \frac{10 + .12(20 - 10)}{.16}$$

$$= ₹ 109.37$$

$$r = 12\%$$

$$P = \frac{10 + .16(20 - 10)}{.16}$$

$$= ₹ 125$$

$$r = 16\%$$

(d) if D/P is 75%

$$P = \frac{15 + .20(20 - 15)}{.16}$$

$$= ₹ 132.81$$

$$P = \frac{15 + .12(20 - 15)}{.16}$$

$$= ₹ 117.18$$

$$P = \frac{15 + .16(20 - 15)}{.16}$$

$$= ₹ 125$$

(e) if D/P is 100%

$$P = \frac{20 + .20(20 - 20)}{.16}$$

$$= ₹ 125$$

$$P = \frac{20 + .12(20 - 20)}{.16}$$

$$= ₹ 125$$

$$P = \frac{20 + .16(20 - 20)}{.16}$$

$$= ₹ 125$$

- 11.** A company earned a net profit ₹20,00,000 and currently has 1,00,000 shares outstanding. Out of the net profit, the company is planning to distribute ₹12,00,000 as dividends to the existing shareholders. If the cost of capital is 12% and the rate of return on investment is 10%, find the market price of the share using Walter's model and what will be the optimum dividend payout ratio. Also calculate the price of the share at the optimum dividend payout ratio.

Sol. (a) $P = \frac{D + r(E - D)}{\frac{K_e}{K_e}}$

$$= \frac{12 + .10(20 - 12)}{.12}$$

$$= ₹ 155.56$$

$$r < K_e$$

$$D = \frac{12,00,000}{1,00,000} = ₹ 12$$

$$E = \frac{20,00,000}{1,00,000} = ₹ 20$$

$$.10 < .12$$

In this case, pay out ratio is 100% i.e. 20

$$P = \frac{20 + \cdot 10 (20 - 20)}{\cdot 12}$$
$$= ₹ 166.67$$

