

Question Paper Security Analysis - I

Part A : Basic Concepts (30 Points)

- This part consists of Questions with serial number 1 – 30.
- Answer **all** questions.
- All questions carry equal points.
- Maximum time for answering Part A is 30 minutes.

1. Which of the following statements is/are **true**?
- I. A bond's price moves inversely proportional to its yield to maturity
 - II. The percentage price change due to a change in yield to maturity increases at a diminishing rate as bond's maturity time decreases
 - III. Given the maturity, the change in bond price will be greater with a decrease in bond's YTM than the change in bond price with an equal increase in the bond's YTM.
- a. Only (I) above
 - b. Only (II) above
 - c. Both (I) and (II) above
 - d. Both (I) and (III) above
 - e. All (I), (II) and (III) above.
2. A 91-day treasury bill of Rs.100 each maturing after 60 days is available in the market at Rs.99. The yield available to an investor is
- a. 6%
 - b. 5%
 - c. 4%
 - d. 3%
 - e. 1%
3. Following information is available regarding stock 'x' :
- | Price as on 1.4.2000 (Rs.) | Price as on 1.4.2001 (Rs.) | EPS for 2000-2001 (Rs.) | Dividend payout ratio (%) |
|----------------------------|----------------------------|-------------------------|---------------------------|
| 20 | 30 | 5 | 50 |
- The rate of return on stock 'x' for the year is
- a. 75.0%
 - b. 62.5%
 - c. 50.0%
 - d. 37.5%
 - e. 25.0%
4. The stage during which an angel investor look for opportunities to invest is / are
- a. Pioneering stage
 - b. Expansion stage
 - c. Stabilization stage
 - d. Declining stage
 - e. Both (b) and (c) above.
5. Which of the following statements is/are **false**?
- I. A unique security market line can be plotted for each security
 - II. The x-axis of the security market line represents betas for different securities
 - III. The slope of the characteristic line is the beta for the particular security involved.
- a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (II) above
 - e. Both (I) and (III) above.

6. Which of the following securities is most liquid?
 - a. Money market instruments
 - b. Capital market instruments
 - c. Gilt-edged securities
 - d. Derivatives
 - e. Both (a) and (b) above.
7. Which of the following statements is **not true** with regard to a depository?
 - a. Filling up transfer deeds and lodging the same with the company for transfer is not necessary
 - b. There would not be any bad deliveries
 - c. Exemption from paying stamp duty on transfer of debentures
 - d. Faster payment on sales of shares
 - e. None of the above.
8. Which of the following scrips is **not** included at present in BSE sensx?
 - a. BHEL
 - b. WIPRO
 - c. Colgate
 - d. Ranbaxy Labs
 - e. Sayam Computers.
9. Which of the following packages provide information about the prices of listed companies?
 - a. CIMM
 - b. CLINE-OLE
 - c. VANS
 - d. Both (a) and (b) above
 - e. All (a), (b) and (c) above.
10. Which of the following forecasting methods have limited relevance in a planned economy?
 - a. Econometric model building approach
 - b. Lead indicator approach
 - c. GNP model building approach
 - d. Diffusion indices approach
 - e. None of the above.
11. For a stock 'y' values of variance of return (σ_y^2) and coefficient of correlation with the market (ρ_{ym}) are given as $289(\%)^2$ and 0.6 respectively. The systematic risk in terms of percentage of total risk (stock variance) will be
 - a. 10.20
 - b. 12.46
 - c. 28.33
 - d. 36.00
 - e. 64.00
12. When a company is passing through an inflationary phase, the company can show higher profits by resorting to _____ method of inventory valuation.
 - a. LIFO
 - b. FIFO
 - c. FILO
 - d. Average cost method
 - e. None of the above.

13. M/s BE Electronics have been experiencing a 2% p.a. decline in its dividend growth rate for the last 3 years. The rate of return expected by investors is 17%. If the dividend per share for the year 2000-2001 was Rs.3 and if the situation continues, the present intrinsic value of the share will be
- Rs.14.86
 - Rs.15.47
 - Rs.16.11
 - Rs.19.60
 - Rs.20.40
14. For the financial year 2000-2001 Infotech Ltd. reported return on equity of 23.2% and its book value per share is Rs.38.80. If there are no preference shares, the earnings per share of Infotech would be
- Rs. 8.3
 - Rs. 9.0
 - Rs.10.9
 - Rs.11.4
 - Rs.11.8
15. Which of the following is/are **true** according to H model?
- According to the model, if the current growth rate is greater than the normal long run growth rate, the growth rate eventually decreases
 - In the model, we make an assumption that in H years the growth decreases from the abnormal growth rate to the normal growth rate.
 - The intrinsic value of a share according to the model is equal to the value based on the normal growth rate plus premium due to abnormal growth rate.
- Only (I) above
 - Only (II) above
 - Both (I) and (II) above
 - Both (I) and (III) above
 - All (I), (II) and (III) above.
16. Which of the following is **not** a constraint for achievement of investment objective?
- Liquidity
 - Age
 - Time horizon
 - Risk tolerance
 - None of the above.
17. Assume that 2-year bonds are yielding 11% and 3 years bonds are yielding 11.5%. The implied yield of 1-year bond after 2 years from now will be
- 11.25%
 - 11.38%
 - 11.75%
 - 12.51%
 - 13.25%
18. Which of the following statements is/are **true**?
- Duration of a bond is used for immunization of interest rate risk
 - Modified duration of a bond can be used as measure of bond volatility.
 - Duration of a 4-year zero coupon bond will always be less than 4 years.
- Only (I) above
 - Only (II) above
 - Both (I) and (II) above
 - Both (II) and (III) above
 - All (I), (II) and (III) above.

19. Which of the following statements is/are **false**?

- I. In case of a put option contract, if stock price > Exercise price, it is said to be out of the money
- II. In case of a call option contract, if stock price < Exercise price, it is said to be in the money
- III. In case of a call or put option contract, if stock price = Exercise price, it is said to be at the money.

- a. Only (I) above
- b. Only (II) above
- c. Only (III) above
- d. Both (I) and (II) above
- e. None of the above.

20. Consider the following information:

Market prices :	Rs.
Stock (of face value Rs.10)	12
Convertible Bond (of face value Rs.100)	125
Conversion rate (i.e. number of shares that can be exchanged for one bond)	10

The premium over conversion value of the bond is

- a. 4.17%
- b. 12.50%
- c. 25.00%
- d. 37.00%
- e. None of the above.

21. The recent crash in stock market in India proves the efficiency of the market in

- a. Weak form
- b. Semi-strong form
- c. Strong form
- d. In between weak and semi-strong form
- e. None of the above.

22. Which of the following statements is **false** with regard to Elliott Wave Theory?

- a. It was originally applied to Dow Jones industrial averages.
- b. The complete cycle has 8 waves – five up and three down.
- c. 3rd wave is always the shortest in five wave advance
- d. Wave A confirms the end of uptrend
- e. Both (c) and (d) above.

23. Which of the following methods is **not** used for analyzing market breadth?

- a. A-D line
- b. % of stocks over a moving average
- c. Diffusion indexes
- d. Rate of change Index
- e. None of the above

24. If the current market price of the stock is Rs.72, exercise price of warrant is Rs.65 and entitled number of shares per warrant is 2, then the maximum value of the warrant is

- a. Zero
- b. Rs. 7
- c. Rs. 14
- d. Rs. 144
- e. None of the above.

25. An option writer writes a 6-m naked put option on a stock at a premium of Rs.6 and the strike price of Rs.120. The prevailing market price of the stock is Rs.140. If on the expiration day price of the stock is Rs.110, then the profit/loss to the option writer will be
- Rs. -10
 - Rs. -4
 - Rs. 4
 - Rs. 10
 - Rs. 16
26. Consider a bond with following features:
 $P_0 = \text{Rs.}1000$; $C = 10\%$ p.a.; $\text{YTM} = 10\%$; $\text{Duration} = 6.76$ years.
 If YTM changes to 11% in alignment of prevailing interest rate the price of the bond would change to
- Rs.922.5
 - Rs.938.5
 - Rs.943.7
 - Rs.946.2
 - Rs.951.3
27. The differences between forwards and the futures market is/are
- In futures markets, the contract terms are highly standardized
 - Traders in futures market require to pay daily settlement margin depending on movement in the price of underlying stock
 - Forward markets are monitored and regulated by special agencies
 - Both (a) and (b) above
 - All (a), (b) and (c) above.
28. The most reliable and widely used price pattern for reversal is
- Flags
 - Triangles
 - Rectangles
 - Head and Shoulders
 - Saucers.
29. If the security prices exhibit semi-strong form of efficiency, one will **not** gain if he
- Analyses the past prices in the form of charts to identify the pattern.
 - Buys stock of a company which has declared a good bonus.
 - Collects inside information about the bad performance of the company.
- Only (I) above
 - Only (II) above
 - Only (III) above
 - Both (I) and (II) above
 - All (I), (II) and (III) above.
30. Which of the following factors have a bearing on the value of real assets?
- Physical characteristics viz the size, age and quality
 - Location
 - Legal environment
 - Both (a) and (b) above
 - All (a), (b) and (c) above.

END OF PART A

Part B : Problems (50 Points)

- This part consists of questions with serial number 1 - 6
- Answer **all** questions.
- Points are indicated against each question.
- Detailed workings should form part of your answer.
- Do not spend more than 110 - 120 minutes on Part B.

1. The stock research division of M/s Kothari Investment services has developed ex-ante probability distribution for the likely economic scenarios over the next one year and estimates the corresponding one period rates of return on stocks A, B and market index as follows:

Economic Scenarios	Probability	One period rate of return %		
		Stock A	Stock B	Market
Recession	0.15	-15	-3	-10
Low growth	0.25	10	7	13
Medium growth	0.45	25	15	18
High growth	0.15	40	25	32

The expected risk-free real rate of return and the premium for inflation are 3.0% and 6.5% p.a. respectively.

As an analyst in a research division you are **required** to :

- a. Calculate the following for stock A and B
 - i. Expected return
 - ii. Covariance of returns with the market returns
 - iii. Beta
- b. Recommend for fresh investment in any of these two stocks. Show all the necessary calculations.

(9 + 3 = 12 points)

2. M/s Vishal Industries have issued earlier a 11.5% convertible bond of face value Rs.1,000 maturing in 2007 A.D. After a period of 3 years on the option of the investor each of these bonds can be converted into 50 equity shares of face value Rs.10 at a premium of Rs.10 each. The investment value of similar non-convertible bond is Rs.870. The current market prices of the bond and the share are Rs.970 and Rs.18.50 respectively. The dividend per share for 2000-2001 is Rs.2.12.

You are **required** to calculate

- a. Premium over conversion value
- b. Premium over investment value
- c. Conversion parity price of share
- d. Break even period.

(2 + 2 + 2 + 3 = 9 points)

3. Construction of a complex, Industrial trade center is proposed to be financed by way of issue of bonds and equity shares in the proportion of 7:3. The details of the instruments are as under:

- i. Bonds are bearing a coupon rate of 12% per annum maturing in 7 years. The interest will be compounded semi-annually. To redeem the bonds a sinking fund is established. The coupon payment is tax deductible.
- ii. Equity investors requires a return of 16%.

The expected net operating income from the property is Rs.75 lakhs and the effective tax rate applicable is 35%.

You are **required** to calculate

- a. Capitalization rate
- b. Market value of property.

(5 + 1 = 6 points)

4. A high networth investor Mr. Rama Murthy has a corpus of Rs.10,00,000 earmarked for fixed income securities. The investment horizon is 5 years.

He is considering investment in one of the following:

- 12% non-convertible debentures of Rajesh Steel Limited (Face value Rs.1000) selling at par. These debentures will be redeemed at par after 5 years. Interest is payable annually.
- 14% non-convertible debentures of Jayesh Float-glass Ltd. (Face value Rs.1000) selling at Rs.1100. These debentures will be redeemed at par after 7 years. Interest is payable annually.

You are **required** to

- Find the interest rate risks of the two investments if the market interest rate increases by 1%.
- Help Mr. Rama Murthy to immunize the investment against any immediate change in interest rates. Which one of the aforementioned instruments will you recommend him for this purpose? Give reasons.
- State whether the investment recommended in (b) above offer perfect immunization and also give conditions to be fulfilled for perfect immunization of bond investment.

(8 + 2 + 2 = 12 points)

5. An investor writes a put option and a call option as given under:

Option type	Stock	Present market price (Rs.)	Option duration (months)	Exercise price (Rs.)	Option premium per share (Rs.)
Call	A	75	3	78	3
Put	B	85	3	87	4

Each contract is for 100 shares.

You are **required** to calculate the margin that the investor has to deposit with the brokerage firm.

(6 points)

6. Given below is the monthly closing prices of M/s Infotech Ltd. for year 2000:

	Rs.
January	1325
February	1310
March	1340
April	1355
May	1375
June	1430
July	1470
August	1495
September	1510
October	1500
November	1480
December	1430

Using the above data you are **required** to prepare a six month exponential moving average (EMA) for the period of July to December of Year 2000.

(5 points)

END OF PART B

Part C : Applied Theory (20 Points)

- This part consists of questions with serial number 7 - 8.
- Answer **all** questions.
- Points are indicated against each question.
- Do not spend more than 25 -30 minutes on Part C.

7. A fundamentalist normally forgets about the investment till his target is attained. However, a broker using technical analysis attempts to buy at every low and sell at every high for reaching the target. There are some tools which are extremely useful in identifying a reversal **much before** a trend peaks or bottoms out. Discuss one such tool.

(10 points)

8. “How’s the market doing?” is frequently the first question investors ask their brokers. This interest in market movement results from the fact that the prices of individual securities tend to vary with market movements. There are many share price index numbers used in India e.g. BSE Sensex, NSE Nifty, S&P CNX50, CRISIL 500. Discuss the factors that influence the construction of index numbers.

(10 points)

END OF PART C

END OF QUESTION PAPER

Suggested Answers

Security Analysis – I : July 2001

Part A : Basic Concepts

1. Answer : (d)
Reason : Of the given alternatives, according to Bond value theorems, Statement II is not correct as percentage price change due to change in yield to maturity increases at a increasing rate as bond's maturity time decreases (see fig. 9.9 in the chapter, 'Bond valuation' on the page no. 247 of text book on SA*.)
2. Answer : (c)
Reason : Yield on treasury bill = $\frac{1}{99} \times \frac{360}{60} = 0.0606$ i.e. 6%.
3. Answer : (b)
Reason : Return on the stock =
$$\frac{(\text{Change in price} + \text{Dividend paid during the year})}{\text{Price at the beginning of the year}}$$
$$= \frac{30 - 20 + 5 \times 0.5}{20} = \frac{12.5}{20} = 0.625 \text{ i.e. } 62.5\%$$
4. Answer : (a)
Reason : Institutional finance is not available at pioneering stage. At this stage angel investor plays the role of venture capitalist.
5. Answer : (a)
Reason : Of the alternatives given (a) is false since SML always represents trade-off between risk and return for a group of securities.
6. Answer : (c)
Reason : Of the securities given, gilt edged securities are considered as most liquid because they are government bonds and are very safe and have an active secondary market.
7. Answer : (e)
Reason : All the given options are the attributes of a depository.
8. Answer : (b)
Reason : Almost three fourth of the share capital is closely held by Sri Ajim Premji and his relatives and the floating stock in market is less therefore, it has not been included in sensex despite high market valuation.
9. Answer : (d)
Reason : See sources of information on page 144 of Text book – SA*. CIMM & CLINE-OLE provide company specific information and VANS is a package which provides information of various articles and news in the newspaper and magazines and hence all the given packages provide information about the prices of listed companies.
10. Answer : (a)
Reason : In a planned economy planning priorities may change significantly, besides likely changes in governmental regulation, fiscal policy, control mechanism of money, credit, prices and wages.

* Security Analysis (SA) Text Book referred bears the code.

11. Answer : (d)

Reason :
$$\frac{\text{Systematic risk}}{\text{Total risk}} = \frac{\beta^2 \sigma_m^2}{\sigma_i^2} = \frac{\left(\rho_{ym} \frac{\sigma_i}{\sigma_m} \right)^2 \sigma_m^2}{\sigma_i^2} = \rho_{ym}^2 = 0.6^2 = 0.36 \text{ i.e. } 36\%.$$

12. Answer : (b)

Reason : In an inflationary phase adopting FIFO method of inventory valuation projects a higher profit by suppressing the cost of raw material consumed.

13. Answer : (b)

Reason : Intrinsic value of share =
$$\frac{D_0(1+g)}{k-g} = \frac{3 \times (1-0.02)}{0.17+0.02} = \frac{2.94}{0.19} = \text{Rs.} 15.47$$

14. Answer : (b)

Reason :
$$\text{EPS} = \text{ROE} \times \text{BVPS} = 0.232 \times 38.80 = \text{Rs.} 9$$

15. Answer : (d)

Reason : According to H model there are two phases of growth – abnormal growth rate and long run normal growth rate and it is assumed that in 2H years the growth decreases from abnormal growth rate to normal growth rate. Hence, statement (II) is not correct.

16. Answer : (e)

Reason : All of (a) to (d) are constraints of investment objective.

17. Answer : (d)

Reason :
$$(1+r_3)^3 = (1+r_2^2)^2 (1+f_2)$$

i.e.
$$(1+f_2) = \frac{(1+0.115)^3}{(1+0.11)^2} = 1.125 \Rightarrow f_2 = 0.1251 \text{ i.e. } 12.51\%$$

18. Answer : (c)

Reason : Of the alternatives given, statement (III) is not correct since the duration of a zero coupon bond is always equal to the maturity period.

19. Answer : (b)

Reason : Of the alternatives given statement (II) is false as for an in-the-money call option contract exercise price shall be less than stock price.

20. Answer : (a)

Reason : Premium over conversion value of the bond =
$$\frac{125-12 \times 10}{12 \times 10} = 0.0417 \text{ i.e. } 4.17\%$$

21. Answer : (a)

Reason : In the past publicly as well as privately held information could influence the stock prices in India which disproves the market efficiency in semi-strong and strong form.

22. Answer : (e)

Reason : According to Elliott Wave Theory (c) is false as the third wave is usually the longest and (d) is also false as it is wave C which confirms the end of uptrend.

23. Answer : (d)

Reason : Of the alternatives given, rate of change index does not measure market breadth but it measures market momentum.

24. Answer : (d)
Reason : Maximum value of the warrant = $P_s \times n = 72 \times 2 = \text{Rs.}144$.
25. Answer : (b)
Reason : Cash flow to option writer = $+6 - 120 + 110 = -4$ i.e. a loss of Rs.4
26. Answer : (b)
Reason : $\Delta P = -\frac{D}{1 + YTM} \times \Delta YTM \times P_o = -\frac{6.76}{1 + 0.1} \times 0.01 \times 1000 = -61.45$ i.e., $P = 1000 - 61.45 = 938.5$
27. Answer : (d)
Reason : (c) is not correct as forward markets are normally not regulated.
28. Answer : (d)
Reason : Flags & Rectangles are consolidation patterns. Triangles and saucers though sometimes indicate reversal but there are not very reliable formation. Head and Shoulders pattern can only be considered as the most reliable and widely used pattern.
29. Answer : (d)
Reason : Privately held information may accrue above normal returns as per semi-strong form of market efficiency.
30. Answer : (e)
Reason : All the factors given in (a), (b) and (c) influence the value of real assets.

Part B : Problems

$$\begin{aligned}
 1. \quad a. \quad i. \quad \text{Expected return on stock} = E(R_A) &= \sum_{s=1}^n R_s P_s \\
 &= 0.15(-15) + 0.25 \times 10 + 0.45 \times 25 + 0.15 \times 40 \\
 &= 17.5\% \\
 E(R_B) &= 0.15 \times (-3) + 0.25 \times 7 + 0.45 \times 15 + 0.15 \times 25 \\
 &= 11.8\% \\
 E(R_M) &= 0.15 \times (-10) + 0.25 \times 13 + 0.45 \times 18 + 0.15 \times 32 \\
 &= 14.65\%
 \end{aligned}$$

ii. Covariances

$$\begin{aligned}
 COV_{AM} &= \sum_{s=1}^n [R_{A_s} - E(R_A)][R_{M_s} - E(R_M)]P_s \\
 &= 0.15 [(-15) - 17.5] [(-10) - 14.65] + 0.25 [10 - 17.5] [13 - 14.65] \\
 &\quad + 0.45 [25 - 17.5] [18 - 14.65] + 0.15 [40 - 17.5] [32 - 14.65] \\
 &= 193.13 (\%)^2
 \end{aligned}$$

$$\begin{aligned}
 COV_{BM} &= 0.15 [(-3) - 11.8] [(-10) - 14.65] + 0.25 [7 - 11.8] [13 - 14.65] \\
 &\quad + 0.45 [15 - 11.8] [18 - 14.65] + 0.15 [25 - 11.8] [32 - 14.65] \\
 &= 95.88 (\%)^2
 \end{aligned}$$

$$\begin{aligned}
 VAR_M (\sigma_m^2) &= 0.15 [(-10) - 14.65]^2 + 0.25 [13 - 14.65]^2 + 0.45 [18 - 14.65]^2 \\
 &\quad + 0.15 [32 - 14.65]^2 \\
 &= 142.03 (\%)^2
 \end{aligned}$$

$$iii. \quad \beta_A = \frac{COV_{AM}}{\sigma_M^2} = \frac{193.13}{142.03} = 1.36$$

$$\beta_B = \frac{COV_{BM}}{\sigma_M^2} = \frac{95.88}{142.03} = 0.675 \approx 0.68$$

b. For ex-ante SML $R(r_i) = r_0 + r_i \beta_{im}$

Where, r_0 = Intercept of SML

r_i = Slope of the SML

If the assumptions at the CAPM are correct, then

$$R(r_i) = r_f + [E(r_m) - r_f] \beta_{im}$$

Where, r_f = Risk free rate

$E(r_m) - r_f$ = Slope of SML

$$\text{Given } r_f = 3.0 + 6.5 = 9.5\%$$

Where, r_f = Inflation adjusted nominal risk free rate.

$$i. \quad R(r_A) = 9.5 + 1.36 \times [14.65 - 9.5] = 16.50\%$$

$$\alpha_A = E(R_A) - R(r_A) = 17.50 - 16.50 = 1.0\%$$

Hence, A is under priced.

$$ii. \quad R(r_B) = 9.5 + 0.675 \times [14.65 - 9.5] = 12.98\%$$

$$\alpha_B = E(R_B) - R(r_B) = 11.80 - 12.98 = -1.18\%$$

Hence, B is over priced.

Therefore, it is recommended to invest in Stock A.

2. a. Premium over conversion value = $\frac{\text{Bond price} - \text{Conversion value}}{\text{Conversion value}}$
- $$= \frac{970 - 18.5 \times 50}{18.5 \times 50} = 0.0486 \text{ i.e. } 4.86\%$$
- b. Premium over investment value = $\frac{\text{Bond price} - \text{Investment value}}{\text{Investment value}}$
- $$= \frac{970 - 870}{870} = 0.1149 \text{ i.e. } 11.49\%$$
- c. Conversion parity price of share = $\frac{\text{Bond price}}{\text{Number of shares on conversion per bond}}$
- $$= \frac{970}{50} = \text{Rs.}19.4$$

The ratio indicates that the price should rise by about 0.9 (i.e. 19.4 – 18.5) which is 4.86% of Rs.18.5 so that parity is reached.

- d. Break even period = $\frac{\text{Conversion premium}}{\text{Interest income} - \text{Dividends}} = \frac{970 - 18.5 \times 50}{115 - 2.12 \times 50} = \frac{45}{9} = 5 \text{ years.}$

The period of 5 years indicates that with the present projections the bond holders should plan for a holding horizon of 5 year before converting into stock.

3. a. Payments to Bond-holders consists of paying the interest and regular contribution to the sinking fund to pay the principal.

Contribution to the sinking fund every 6 month for 7 years

$$= \frac{\frac{i}{f}}{\left(1 + \frac{i}{f}\right)^{n \times f} - 1} = \frac{\frac{0.12}{2}}{\left(1 + \frac{0.12}{2}\right)^{7 \times 2} - 1} = 0.0476$$

Alternately,

Consider bond price Rs.100 the sinking fund every six month

$$A = \frac{100}{\text{FVIFA}(6\%, 14)} = \frac{100}{21.015} = 4.759 \text{ i.e. } 0.0476 \text{ per rupee for six months}$$

Hence, per annum the contribution will be $(1 + 0.0476)^2 - 1 = 0.0975$

After tax effective annual interest = $(1 + 0.06)^2 - 1 - 0.12 \times 0.35 = 0.0816$

Therefore, total payments on bond = $0.0816 + 0.0975 = 0.1791$

Calculation of weighted rates

Instruments	% Employed	Required of return (%)	Weighted rates (%)
Bonds	70	17.91	12.54
Equity	30	16.00	4.80
			17.34

Therefore, the capitalization rate is 17.34%.

- b. Market value of the property = $\frac{\text{Net operating Income}}{\text{Capitalization rate}} = \frac{75,00,000}{0.1734} = 4,32,52,595.16$

4. a. To compute the interest rate risk, it is essential to calculate the YTM, duration

I. YTM of the two bonds:

A. Bond of Rajesh Steel (R)

Selling at par and is redeemable at par

$$\therefore K_R = \text{Coupon rate} = 0.12$$

B. Bond of Jayesh Float Glass Ltd. (J)

$$1100 = 140 \times \text{PVIFA}_{(k\%, 7 \text{ years})} + 1000 \times \text{PVIF}_{(k\%, 7)}$$

Consider $k = 12\%$

$$\text{R.H.S} = 140 \times 4.564 + 1000 \times 0.452 = 1090$$

$$\Rightarrow K_J \approx 12\%$$

II. Durations of the two bonds:

$$D = \frac{r_c}{r_d} \times \text{PVIFA}(r_d, n) \times (1 + r_d) + \left(1 - \frac{r_c}{r_d}\right) \times n$$

Where, r_c = Current yield

r_d = YTM

n = Period to maturity in years.

$$\begin{aligned} D_R &= \frac{0.12}{0.12} \times \text{PVIFA}_{(12\%, 5)} \times 1.12 + \left(1 - \frac{0.12}{0.12}\right) \times 5 \\ &= 3.605 \times 1.12 = 4.04 \end{aligned}$$

$$\begin{aligned} D_J &= \frac{140/1100}{0.12} \times \text{PVIFA}_{(12\%, 7)} \times 1.12 + \left(1 - \frac{140/1100}{0.12}\right) \times 7 \\ &= 1.06 \times 4.564 \times 1.12 + (1 - 1.06) \times 7 \\ &= 5.42 - 0.42 = 5.0 \end{aligned}$$

III. Interest rate risk of the two bonds

$$\frac{\Delta P_0}{P_0} = -D \times \frac{\Delta \text{YTM}}{1 + \text{YTM}}$$

For bond of Rajesh Steel

$$\frac{\Delta P_R}{P_{R_0}} = -4.04 \times \frac{0.01}{1 + 0.12} = -0.0361 \text{ i.e. } 3.61\% \text{ decrease in bond price for increase in YTM by } 1\%.$$

For bond of Jayesh Float Glass Ltd.

$$\frac{\Delta P_J}{P_{J_0}} = -5 \times \frac{0.01}{1 + 0.12} = -0.0446 \text{ i.e. } 4.46\% \text{ decrease in bond price for increase in YTM by } 1\%.$$

- b. To achieve immunization which implies eliminating the interest rate risk, the duration of the asset must be set equal to the holding period of the investor. In this case holding period of the investor is 5 years hence bond's of Jayesh Float Glass Ltd. which is having a duration of 5 years is recommended.
- c. The investment alternative recommended in (b) will be giving perfect immunization only if the following assumptions hold good:
- There is no default risk of the Jayesh Float Glass bonds.
 - The buy and hold strategy is adopted by the investor
 - There is only instantaneous change in interest rate during the investment horizon.
 - The term structure is flat.

5. i. The call option is an “out of money” contract. Therefore, we calculate the margin by both the methods
Method I:

$$\begin{aligned}\text{Margin} &= 100 [\text{Option premium} + 0.20 \times (\text{Stocks' market price}) \\ &\quad - (\text{Amount by which the contract is out of money})] \\ &= 100 [3 + 0.2 \times 75 - (78 - 75)] \\ &= 100 \times 15 = 1500\end{aligned}$$

Method II:

$$\begin{aligned}\text{Margin} &= 100 \times [\text{Option premium} + 0.1 \times \text{Stocks' market price}] \\ &= 100 \times [3 + 0.1 \times 75] = 1050\end{aligned}$$

Since the margin obtained by method I is greater, the investor has to deposit Rs.1500 as margin.

- ii. The put option is an “In the money” contract

Therefore,

$$\begin{aligned}\text{Margin} &= 100 [\text{Option premium} + 0.2 \times \text{Stocks' market price}] \\ &= 100 [4 + 0.2 \times 85] = 2100\end{aligned}$$

The total margin the investor has to deposit is given by the sum of margin required for call and put option contracts. That is Rs.1500 + Rs.2100 = Rs.3600

6. Smoothing factor for 6 month EMA = $\frac{2}{6} = \frac{1}{3} = 0.33$

Month	Closing price (1)	EMA for previous month (2)	(3) = (1) – (2)	(4) = 0.33×(3)	EMA (5) = (2) + (4)
1	1325	–	–	–	–
2	1310	–	–	–	–
3	1340	–	–	–	–
4	1355	–	–	–	–
5	1375	–	–	–	–
6	1430	–	–	–	1355.83*
7	1470	1355.83	114.17	37.68	1393.51
8	1495	1393.51	101.49	33.49	1427.00
9	1510	1427.00	83.00	27.39	1454.39
10	1500	1454.39	45.61	15.05	1469.44
11	1480	1469.44	10.56	3.48	1472.92
12	1430	1472.92	–42.92	–14.16	1458.76

* The value in 6th row last column i.e. 1355.83 is the SMA (Simple Moving Average) of the first 6 closing prices.

Part C : Applied Theory

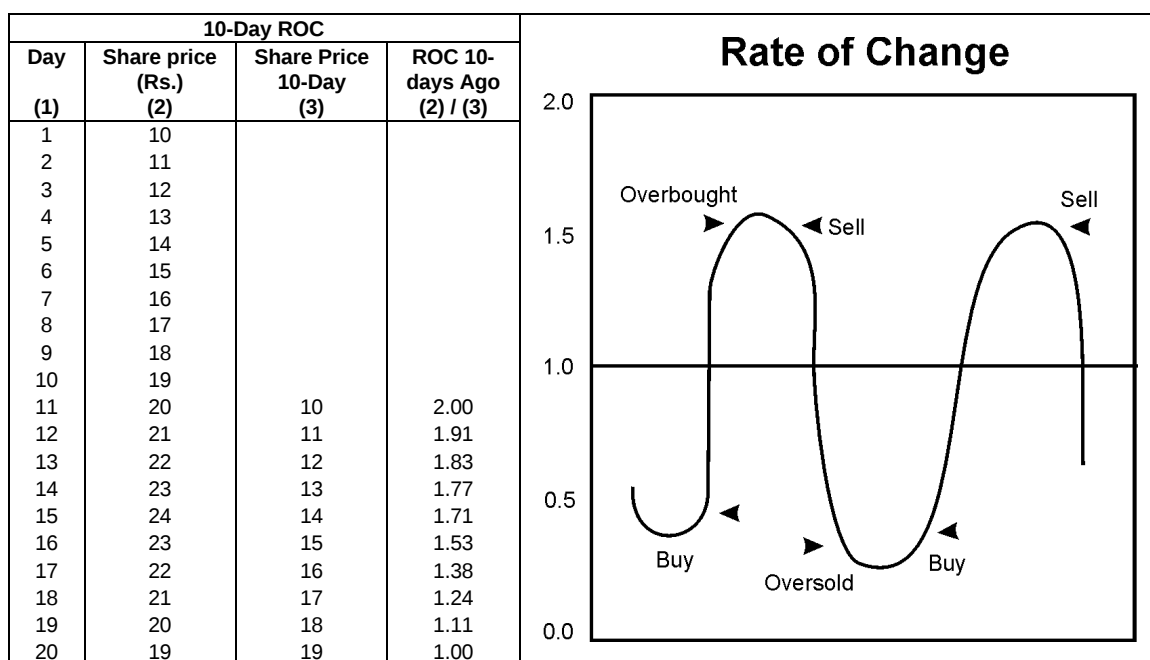
7. Momentum indices are extremely useful in identifying a reversal much in advance. The most popular indices are:

- Rate of Change (ROC)
- Relative Strength Index (RSI)
- Moving average convergence and divergence (MACD)

Rate of Change (ROC)

Rate of change measures the rate at which prices rise or fall. It is based on the principle that prices usually rise and fall at the fastest pace well ahead of their peak and before their trough respectively.

The concept of ROC can be explained with the help of a single example. A ball thrown into the air generally shoots up with speed but subsequently slows down considerable before it turns to come down again. The loss of upward momentum that occurs before the ball changes course can be seen in the stock market also. Before peaking out, share prices register a noticeable decrease in momentum.



To measure the rate of change, the ratio of the most recent closing price to the price for a certain number of days in the past is worked out. To calculate a 10-day ROC, the latest closing price is divided by the closing price of the scrip 10 days ago.

If the latest price is higher than that of the historical price for the ten previous days, the ROC value will be above the line 1 and vice versa.

In the following table an example of 10-day ROC is explained. Under column 2 the share price movement of a company is provided for 20 days while under column (3) the prices ruling 10 days ago has been taken. In the last column, the ROC values are arrived at by dividing the current days price by the price 10 days ago. The ROC values are available from the 11th day only as for the first 10 trading days. The 10 days back share prices are not available. It is worth noting that the share prices are available only on the trading that actually took place in the market.

Therefore, the ROC is computed for 10 trading days and not 10 calendar days. The share price has been increased by Re.1 on every trading day from day 1 to day 15. However, the ROC declined continuously from the 11th day to 15th day, though the share price in rupee terms increased.

This indicates that though there was a share price rise in absolute terms, in percentage terms the rise in share price declined during that period.

- If the ROC line is above 1; the current day price is higher than that of 10 days ago.
- If the ROC line is above 1 and rising; the difference between the current day price and 10 days back price grows at an increasing rate (bullish signal).
- If the ROC line is above 1, but declining; the price rises at a lower rate than the earlier growth rate (bearish signal).
- If the ROC line is below 1, the current days price is lower than the price 10 days ago.
- If the ROC line is below 1 and falling, the difference between current price and 10 days back price grows at a faster rate (bearish signal).
- The ROC line is so constructed that it is always a step ahead of the price movement. It gives an advance signal before the share price line takes a reversal direction.

Note: As the question requires discussion of only one such tool ROC has been discussed above. For RSI and MACD students may refer the prescribed text book.

8. The factors that influence the construction of index numbers

To ensure that an index number serves the objectives/purposes mentioned above, a careful attention must be given to the following factors that influence the construction of index numbers:

- Selecting the shares for inclusion in the index-sampling
- Determining the relative importance of cash share included in the sample weighting and
- Averaging the included shares into a single measure.

Selecting Stocks for Inclusion

An index can be based on a sample of stocks or all of them. When the index is based on all listed shares, then the question of sampling does not arise. But when the index is based on a sample the utility of the index will depend upon the degree to which one can infer movements in excluded shares on the basis of movements in the included shares.

So, an index based on a sample will be the desired measure only when; (a) the shares of relatively few listed companies constitute a large proportion of the value of the shares of all listed companies; and (b) there is a tendency for all share prices to move together.

Determining the Relative Importance of the Share

To determine the relative importance of each included share in the overall index, we need to have a system of weighting the shares. The system of weighting is usually determined by the purpose for which the index number is constructed.

There are two popular ways of weighting the shares included in the sample: (a) assign weights based on the market values and (b) assign equal weights to relative price changes. When weights are assigned on market value basis, the index number is typically defined as follows:

$$\frac{\sum_{t=1}^N PR_{it} W_i}{\sum_{t=1}^N W_i} \times 100 \quad \dots\dots\dots (1)$$

where PR_{it} = Price relative of share i in period t which is equal to $\frac{P_{it}}{P_{io}}$ i.e. price of share i in period t divided by the price of the share in the base year.
 W_i = Weight proportional to the market value of share i in the base year dividend by market value of all shares of the sample during the base year.
 N = Size of the sample.

When relative price changes are equally weighted the index number is defined as

$$\frac{\sum_{i=1}^N PR_{it}}{N} \times 100 \quad \dots\dots\dots (2)$$

Where N denotes the size of the sample.

The method of weighting based on market values is appropriate for indicating changes in the aggregate market value of stocks, while the latter method is more appropriate for indicating the price movements of typical stocks.

Methods of Averaging

Two kinds of averages are used in constructing share price indices – arithmetic mean and the geometric mean. Between the two averages, the arithmetic mean is more widely used. However, before we evaluate these methods, it must be emphasized that the indices based on averages are not the same as the averages. The following table clarifies this point.

Share	Base period price (Rs.)	Current period price (Rs.)
A	70	110
B	50	72
C	65	45
D	40	44
Average	Rs.56.25	Rs.67.75
Index Number	100	120.44

The index number in the above table is based on the arithmetic average. The difference between this average and the average we defined in equation (1) being that the former is an unweighted arithmetic average while the latter is a weighted arithmetic average. Instead of using the arithmetic average, we can use the geometric average to determine the index number. In the above example, the index number based on the geometric mean will be given by

$$\left(\frac{110}{70} \times \frac{72}{50} \times \frac{45}{65} \times \frac{44}{40} \right)^{\frac{1}{4}} \times 100 = 1.1457 \times 100 = 114.57.$$