

Question Paper

Security Analysis – I (211) : January 2003

Part A : Basic Concepts (30 Points)

- This part consists of questions with serial number 1 - 30.
- Answer **all** questions.
- Each question carries one point.
- Maximum time for answering Part A is 30 Minutes.

1. Consider the following data:

Ratios	2001	2002
PAT/PBT	0.6250	0.6475
PBT/NS (%)	12.50	12.60
NS/TA	1.50	1.72
TA/NW	2.25	2.90
ROE (%)	26.37	41.34

The rise in ROE has taken place in 2002 due to

- I. Increase in profit margin
 - II. Increase in leverage
 - III. Lower tax efficiency
 - IV. Increase in asset turnover.
- a. Both (I) and (II) above
 - b. Both (I) and (III) above
 - c. Both (II) and (IV) above
 - d. (I), (II), and (IV) above
 - e. (I), (II) and (III) above.
2. The following details pertain to an issue of convertible bonds by M/s. Krishna Ltd.

	Rs.
Bond price	100
Market price of one Equity (face value Rs.10)	8.25
Conversion Rate	11

The conversion parity price of the stock is

- a. Rs. 8.25
- b. Rs. 9.09
- c. Rs. 9.25
- d. Rs.10.19
- e. Rs.10.45.

3. Which of the following formula estimates duration of a perpetual bond?

- a. $\text{Duration} = \frac{1}{1 + \text{YTM}}$
- b. $\text{Duration} = \frac{\text{YTM}}{1 + \text{Coupon rate}}$
- c. $\text{Duration} = \frac{\text{YTM}}{1 + \text{Current yield}}$
- d. $\text{Duration} = \frac{\text{Coupon rate}}{1 + \text{Current yield}}$
- e. $\text{Duration} = \frac{\text{Current yield}}{1 + \text{Coupon rate}}$

4. Which of the following is **not** the reason for attractiveness of real estate?

- a. Capital appreciation of real estate is, in general, very high.
- b. Loans are available from various Financial Institutions/Banks for buying or constructing real estate.
- c. Interest on loans taken for buying or constructing a residential home is tax deductible within certain limits.
- d. Wealth tax applicable on real estate is very low in India.
- e. Ownership of a residential property provides psychological satisfaction.

5. Consider the following data of a International fund:

	Rs. in crores
Investment	2,250.00
Receivable	175.00
Accrued Income	62.00
Other current assets	672.50
Liabilities	725.00
Accrued expenses	115.25

The number of outstanding units is 175 crores and the public offer price is Rs.13.52. The % sales charge on the NAV is

- a. 1.50%
- b. 2.00%
- c. 2.75%
- d. 3.25%
- e. 4.00%.

6. Other things being equal, which one of the following bonds will have the maximum volatility?

- a. 15-year, 15% coupon bond
- b. 5-year, 10% coupon bond
- c. 15-year, 10% coupon bond
- d. 5-year, 15% coupon bond
- e. 10-year, 15% coupon bond.

7. Which of the following is/are **not** a clear bearish signal?

- a. Head & Shoulders
- b. Double bottom
- c. Triangle
- d. Double top
- e. Both (b) and (c) above.

8. The correlation coefficient between the market return and return of stock is 0.35. The standard deviation of stock's return is 15% and market return is 12.5%. The percentage variance of return on stock A that is **not** explained by the variance in the market return is
- 12.25%
 - 35.00%
 - 45.25%
 - 87.75%
 - 92.50%
9. Which of the following is/are **true**?
- Basis = Futures price – Current cash price.
 - Generally basis is low for contracts with longer maturity.
 - The basis for normal markets usually exhibit convergence.
 - Basis is also a valuable indicator for predicting future spot prices of the commodities that underlie the futures contract.
- Both (I) and (II) above.
 - Both (I) and (III) above.
 - Both (II) and (IV) above.
 - Both (III) and (IV) above.
 - (II), (III) and (IV) above.
10. Required rate of return on a stock is 15.00% and it has paid a dividend of Rs.2.75 for the year 2002-2003. If the stock is currently available at a price of Rs.52, the implied growth rate in dividends is
- 6.35%
 - 7.85%
 - 9.22%
 - 9.72%
 - 10.05%.
11. Which of the following factors decide the value of a real estate?
- Location
 - Physical characteristics like size, age and quality
 - Laws and regulations regarding zoning, floor space index and easement rights.
- Only (I) above
 - Only (II) above
 - Only (III) above
 - Both (I) and (II) above
 - All (I), (II) and (III) above.
12. Which of the following statements is/are **true**?
- The sponsor of a mutual fund can be only Private Ltd. Companies
 - The sponsor company should have a track record of 10 years
 - The sponsor should at least contribute 40% to the net worth of the AMC
 - The units of a close-ended scheme can be converted into an open-ended scheme
 - Both (c) and (d) above.
13. The total number of unique covariances among stocks in a portfolio is 1225. The number of stocks in the portfolio is
- 35
 - 45
 - 50
 - 60
 - 75.

14. Which of the following measures the sensitivity of duration to change in the interest rates?
- Interest rate elasticity
 - Modified duration
 - Convexity
 - Current yield
 - None of the above.
15. In which of the following stages of industry life cycle, the financial policies of a firm become firmly established?
- Expansion stage
 - Stabilization stage
 - Declining stage
 - Pioneering stage
 - Growth stage.
16. If the duration of a bond is 7 years and change in its price due to -0.50% change in the interest rate is $+3\%$, its YTM will be
- 14.28%
 - 16.67%
 - 17.25%
 - 20.23%
 - 21.25%.
17. Closing prices of the stock of First Global Ltd. is given below:

Day	Closing Price (Rs.)
1	230.50
2	235.50
3	222.10
4	225.10
5	230.10

- The relative strength of the stock is
- 0.9952
 - 1.0366
 - 1.0925
 - 1.1125
 - 1.1175
18. The built-up method of calculating the capitalization rate of a real estate is sum of
- Risk free rate
 - Recapture premium
 - Rate for illiquidity
 - Rate for risk
- Both (I) and (II) above
 - Both (II) and (III) above
 - Both (III) and (IV) above
 - (I), (II) and (IV) above
 - (I), (II), (III) and (IV) above.
19. The annual coupon payable on a bond with a face value Rs.1,000 is 10%. The term to maturity of the bond is 5 years. If the yield on bond declines from 11% to 9%, capital gain on the bond will be
- Rs.38.90
 - Rs.75.85
 - Rs.100.25
 - Rs.112.35
 - Rs.150.35

20. Market breadth **cannot** be analyzed using
- Advance-Dcline lines
 - Diffusion index
 - Stocks in positive trend
 - High-low statistics
 - Rate of change.
21. The coupon rate on a tax-exempt bond is 6.3% and the coupon rate on a similar taxable bond is 9%. Both bonds are presently selling at par. The tax bracket under which an investor would be indifferent between selecting these two bond is
- 10%
 - 20%
 - 30%
 - 40%
 - 45%.
22. The required rate of return on a stock is 12.5% and it is showing a constant growth rate of 9%. If the stock's retention rate is 70%, its P/E ratio should be
- 7.32
 - 8.57
 - 9.34
 - 10.25
 - 11.25.
23. Which of the following is **true** when the 100-day moving average line moves below the declining 300-day moving average line?
- A bullish signal is indicated.
 - A bearish signal is indicated.
 - A trend reversal is signaled.
 - A secondary reaction is signaled.
- Only (I) above
 - Only (II) above
 - Both (II) and (III) above
 - Both (III) and (IV) above
 - (I), (II) and (IV) above.
24. Performance funds invest in
- High P/E ratio stocks
 - High P/BV stocks
 - High price-volatility stocks
 - Low volume stocks
- Only (I) above
 - Both (I) and (II) above
 - Both (I) and (III) above
 - Both (II) and (III) above
 - (I), (II) and (IV) above.

25. The following information is available about a stock and the market

Stock:	Beta	= 1.5
	Growth rate	= 4%
Market:	Return	= 10%
	Risk free rate	= 7%

The duration of stock is

- a. 9.52 years
- b. 13.33 years
- c. 17.25 years
- d. 19.25 years
- e. 33.33 years.

26. Consider the following data for a stock:

Current abnormal growth rate	= 8%
Normal growth rate	= 4%
Current dividend per share	= Rs.3.00
Required rate of return	= 12.5%

If the time period during which the current abnormal growth rate will become normal growth rate is 6 years, the premium on the stock due to abnormal growth rate is

- a. Rs.1.41
- b. Rs.4.24
- c. Rs.8.26
- d. Rs.9.21
- e. None of the above.

27. According to Security Market line

- I. The steeper the slope of the ex-ante SML, the more averse investors are to assuming additional risk.
- II. The steeper the slope of ex-ante SML, the less averse investors to assuming additional risk.
- III. Underpriced securities plot above ex-post SML.
- IV. Overpriced securities plot below ex-post SML.

- a. Both (I) and (III) above
- b. Both (II) and (III) above
- c. Both (III) and (IV) above
- d. (I), (III) and (IV) above
- e. (II), (III) and (IV) above.

28. A bond's duration equals to its maturity under which of the following conditions?

- I. The bond's coupon rate equals the market interest rate.
- II. The bond pays no coupon.
- III. The bond is a deep discount bond.
- IV. The bond pays a single period cash flow.

- a. Only (II) above
- b. Both (II) and (IV) above
- c. Both (II) and (III) above
- d. (I), (II) and (III) above.
- e. (II), (III) and (IV) above.

29. Speculative blow off means

- a. The loss incurred by a speculator by too much of speculation
- b. After a slow expansion over a period, sometimes both prices and volume work into an exponential rise, this is indicative of heavy off-loading by bulls
- c. At the end of a bearish phase, the last group of bears sell the stock and prices fall for considerable time at an accelerated pace and are accompanied by expanding volume
- d. The gain accrued to an investor in a bearish market
- e. None of the above.

30. If 'Distribution' stage is accompanied by high volume then

- a. There is panic liquidation
- b. The stock price moves upward
- c. The stock price starts crashing
- d. There is no steep rise or fall in a share's price
- e. The stock price remains stable.

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 following are yields on zero coupon bonds:

Maturity (Years)	YTM
1	9%
2	10%
3	11%

Assuming that the expectation hypothesis of term structure holds good,

- Calculate the implied one-year forward rates and prices of the zero coupon bonds having a face value of Rs.1000.
- Calculate the expected yield to maturities and prices of one year and two year zero coupon bonds at the end of first year.
- If you have purchased two-year and three-year zero coupon bonds and your holding period is one year, what will be your expected total return on these two bonds?
- Calculate the current price of a 3-year bond having a face value of Rs.1,000 with a coupon rate of 11%. If you buy this bond at the current price and hold for one year, what is the expected holding period return?

(2 + 2 + 3 + 5 = 12 points)

2. The following are risk and return estimates for two stocks:

Stock	Expected return	Beta	Firm specific standard deviation of the expected return
A	12%	0.75	30%
B	16%	1.10	45%

The market index has a standard deviation of 22% and risk free rate (on T-bills) is 5%.

Required:

- Calculate the standard deviation of expected returns on stocks A & B.
- Suppose a portfolio is to be constructed with the following proportions:

Stock A	0.25
Stock B	0.40
T-bills	0.35

Calculate the expected return, standard deviation of expected return and non-systematic risk (standard deviation) of the portfolio.

(2 + 5 = 7 points)

3. To check the market efficiency in semi-strong form, an analyst collected the following information:

Month	Closing price of HLL Rs.	Closing value of Sensex
November 01	210.10	3,287.56
December 01	223.65	3,262.33
January 02	220.70	3,311.03
February 02	249.80	3,502.31
March 02	225.35	3,469.35
April 02	202.80	3,338.16
May 02	184.85	3,125.73
June 02	193.35	3,244.70
July 02	171.00	2,987.65
August 02	186.70	3,181.23
September 02	172.65	2,991.36
October 02	160.30	2,949.32

Using the data for last 2 years, the characteristic line arrived by the analyst is

$$r_{st} = 2.50 + 0.75 r_{mt}$$

Where r_{mt} is % monthly return on market in the month t.

r_{st} is % monthly return on HLL stock in the month t.

You are **required** to conduct the residual analysis to test semi-strong form of market efficiency.

(7 points)

4. MRF Ltd. is planning to start a major restructuring plan. If the restructuring plan is under taken it will reduce the EPS of the company to Rs. 6.50 but enhances the payout rate to 75%. The restructuring plan enables the company to pay dividend that grow at the rate of 22% for the next 4 years and it declines to 11% over the 4 years after that. The dividend growth rate is expected to stabilized at 11% and remains at that level forever.

The risk free rate of return 5% per annum and the market return is expected to be 12% with a standard deviation of 12.5%. The covariance of MRF's stock with that of market is 175 (%)²

You are **required** to calculate the price of the stock if the restructuring is under taken by the company.

(8 points)

5. Mr. Rohit Sharma is required to make the following payments at the end of each year for the next 6 years.

Year	Payment (Rs. lakhs)
1	25.50
2	19.25
3	18.25
4	17.50
5	19.50
6	17.50

He is planning to immunize his liability by investing in the following two bonds.

Bond X: 11% coupon bond of face value Rs.1,000 maturing after 5 years, redeemable at 5% premium and currently traded at Rs.966.38.

Bond Y: 13% coupon bond of face value Rs.1,000 maturing after 3 years, redeemable at 5% discount and currently traded at Rs.988.66.

Required:

- If the interest rate is 12%, calculate the proportions of funds to be invested in bonds X and Y, so that Mr. Sharma's payments are immunized.
- After 1 year, if interest rate changes to 14%, determine the adjustment to be made so that Mr. Sharma's portfolio will remain immunized.

(5 + 5 = 10 points)

6. Data for 7-day trends of Group A scrips of BSE is given below:

Day	Advances	Declines	Unchanged
1	96	96	7
2	140	53	6
3	120	75	4
4	79	115	5
5	102	88	9
6	99	95	5
7	90	102	7

Calculate:

- Short period A-D line
- Long period A-D line.

(2 + 4 = 6 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. Forecasting economic scenario is an integral part of the fundamental analysis process. What are the important techniques of forecasting economic scenarios? Discuss.

(10 points)

8. Write short notes on:

- Triangles
- Stochastic
- Flags.

(4 + 3 + 3 = 10 points)

END OF PART C

END OF QUESTION PAPER

Suggested Answers

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Part A : Basic Concepts

1. Answer : (d)

Reason : The profitability rate increased by 0.10% which is evident from the $\frac{PBT}{NS}$ ratio. Hence (I) is correct. $\frac{TA}{NW}$ has increased from 2.25 to 2.90 which means leverage has increased. Thus, (II) is also correct. Asset turnover ratio has also increased from 1.50 to 1.72. Hence (IV) is also true. $\frac{PAT}{PBT}$ indicates tax efficiency and higher value shows lower tax burden and high tax efficiency of the firm. Hence (II) is wrong and therefore, (d) is the correct answer.

2. Answer : (b)

Reason : Conversion parity price of stock = $\frac{\text{Bond Price}}{\text{No. of shares on conversion per warrant}}$

$$= \frac{100}{11} = \text{Rs. 9.09}$$

3. Answer : (c)

Reason : Duration of perpetual bond = $\frac{YTM}{1 + YTM}$ or $\frac{\text{Current yield}}{1 + \text{Current yield}}$

As the YTM of perpetual bond is equal to its current yield, duration of perpetual bond can be calculated by the formula = $\frac{YTM}{1 + \text{Current yield}}$.

4. Answer : (d)

Reason : A real estate represents a very attractive investment proposition for the following reasons:

- i. Capital appreciation of real estate is, in general very high.
- ii. Loans are available from various financial institutions/banks for buying or constructing real estate.
- iii. Interest on loans taken for buying or constructing a residential home is tax deductible within certain limits.
- iv. Ownership of a residential property provides psychological satisfaction.

Hence (a), (b), (c) and (e) are correct. However wealth tax applicable or real estate is not very low and hence (d) is the answer.

5. Answer : (b)

Reason :
$$NAV = \frac{2250 + 175 + 62 + 672.50 - 725 - 115.25}{175} = \text{Rs. 13.25}$$

Public offer price = $\frac{NAV}{1 - \text{Sales charge}}$

$$1 - \text{Sales charge} = \frac{13.25}{13.52}$$

$$1 - \text{Sales charge} = 0.98$$

$$\text{Sales charge} = 1 - 0.98 = 0.02 = 2\%.$$

6. Answer : (c)

Reason : Volatility of a bond depends on its duration. If duration is greater, its volatility will be also maximum. There are five bonds with 5, 10 and 15-year maturities. Bonds with 15-year maturity period bear higher duration than bonds with 5 and 10-years maturity. Hence, (b), (d) and (e) are not correct. Again, larger the coupon rate, smaller the duration of bond and hence 15-year bond with 15% coupon will have lower duration than bonds with same maturity but with 10% coupon rate. Hence duration of 15-year, 10% bond will be greatest and hence would be experiencing maximum volatility. Therefore, (c) is correct.

7. Answer : (e)

Reason : Head and Shoulders and Double Top are technical indicators which indicates bearish market. Hence (a) and (d) are not correct. Double bottom indicates a bull market and triangles are commonly used to identify reversals and consolidation but are not very reliable formation. Therefore, (b) and (c) are not clear bearish signal and (e) is the answer.

8. Answer : (d)

Reason : Percentage of variance of Stock A that is not explained by the variance in the market return is the percentage unsystematic risk of the stock.

$$\begin{aligned}\frac{\text{Unsystematic risk}}{\text{Total risk}} &= \frac{(1 - \rho^2) \sigma_i^2}{\sigma_i^2} \\ &= [1 - (0.35)^2] = 1 - 0.1225 \\ &= 0.8775 = 87.75\%\end{aligned}$$

9. Answer : (d)

Reason : We define basis as the difference between the current cash price of the commodity and futures price.

Basis = Current cash price – Futures price. Hence (I) is not correct.

Generally basis is higher for contracts with longer maturity. Hence (II) is also wrong. The basis for normal market usually exhibits convergence and basis is also a valuable indicator for predicting future spot prices of the commodities that underlies the futures contract. Hence, (III) and (IV) are correct and (d) is the answer.

10. Answer : (c)

$$\text{Reason : } P_0 = \frac{D_1}{(k_e - g)}$$

$$P_0 = \frac{D_0 (1 + g)}{k_e - g}$$

$$52 = \frac{2.75 (1 + g)}{0.15 - g}$$

$$\frac{52}{2.75} = \frac{1 + g}{0.15 - g}$$

$$18.909 = \frac{1 + g}{0.15 - g}$$

$$2.836 - 18.909g = 1 + g$$

$$\frac{1}{19.909} = g$$

11. Answer : (e)

Reason : The value of a real estate property is determined by the following factors:

- a. Physical characteristics like size, age and quality.
- b. Location and
- c. Law and regulations regarding zoning, floor space index and easement rights.

12. Answer : (e)

Reason : The sponsor of a mutual fund can be a public limited or private limited company and the sponsor should have a track record of 5 years. Hence (a) and (b) are wrong. The sponsor should contribute atleast 40% to the networth of the AMC. The units of a close ended scheme can be converted into an open-ended scheme. Therefore, (c) and (d) are correct and (e) is the answer.

13. Answer : (c)

Reason : No. of covariances = $\frac{n(n-1)}{2} = 1225$

$$n(n-1) = 2450$$

$$n^2 - n - 2450 = 0$$

$$n^2 - 50n + 49n - 2450 = 0$$

$$n(n-50) + 49(n-50) = 0$$

$$n = 50 \text{ or } -49$$

The number of stocks in the portfolio $n = 50$.

14. Answer : (c)

Reason : Interest rate elasticity can be defined as $\frac{\text{Percentage change in price for bond in period } t}{\text{Percentage change in yield to maturity for bond } i}$

$$\text{Modified duration} = \frac{\text{Duration}}{1 + YTM / f}$$

$$\text{and Current yield} = \frac{\text{Coupon Income}}{\text{Current price of bond}}$$

Hence, (a), (b) and (d) are not correct. Convexity measures the sensitivity of duration to change in the interest rates. Therefore, (c) is the correct answer.

15. Answer : (a)

Reason : Financial policies become firmly established at the expansion stage. Hence (a) is the correct answer.

16. Answer : (b)

Reason : % change in price of a bond = $-MD \times \Delta Y$

$$= \frac{-D}{1 + Y / f} (\Delta Y)$$

$$3\% = - \left(-0.50 \times \frac{7}{1 + YTM} \right)$$

$$1 + YTM = \frac{3.5}{3} = 1.1667$$

$$YTM = 16.67\%.$$

17. Answer : (b)

$$\begin{aligned}\text{Reason : Relative strength of the stock} &= \frac{\text{Average of upclosing prices}}{\text{Average of downclosing prices}} \\ &= \frac{235.50 + 225.10 + 230.10}{\frac{3}{222.10}} \\ &= \frac{230.23}{222.10} = 1.0366\end{aligned}$$

18. Answer : (e)

Reason : In the built up method, the capitalization rate is the sum of the following rates:

- a. Rate for risk
- b. Pure interest or the risk-free rate
- c. Recapture premium
- d. Rate on asset being illiquid.

Clearly (I), (II), (III) and (IV) are correct and hence (e) is the answer.

19. Answer : (b)

Reason : Coupon rate = 10%

Term to maturity = 5 years

Yield = 11%

$$\begin{aligned}\text{Price of the bond} &= 100 \times \text{PVIFA}(11, 5) + 1,000 \times \text{PVIF}(11, 5) \\ &= 963.05\end{aligned}$$

$$\begin{aligned}\text{Price of the bond, when yield decreases to 9\%} &= 100 \times \text{PVIFA}(9, 5) + 1,000 \times \text{PVIF}(9, 5) \\ &= 1,038.90\end{aligned}$$

$$\text{Capital gain} = 1,038.9 - 963.05 = \text{Rs.}75.85$$

20. Answer : (e)

Reason : Apart from Advance-Delay lines, breadth of the market can be analyzed using:

- i. Stocks in positive trend
- ii. Diffusion index
- iii. High-low statistics
- iv. Percentage of stocks over a moving average.

Hence (e) is the answer.

21. Answer : (c)

Reason : Coupon rate on tax exempt bond = 6.3%

Coupon rate on taxable bonds = 9%

Let tax rate be T, then an investor will be indifferent between selecting these two bonds will be

$$9\% (1 - T) = 6.3\%$$

$$(1 - T) = \frac{6.3}{9} = 0.70$$

$$1 - T = 70\%$$

$$T = 30\%.$$

22. Answer : (c)

$$\begin{aligned}\text{Reason : } P_0 &= \frac{D_1}{k_e - g} = \frac{D_0 (1 + g)}{k_e - g} \\ P_0 &= \frac{E_0 (1 - R.R.) (1 + g)}{k_e - g} \\ \frac{P_0}{E_0} &= \frac{(1 - R.R.) (1 + g)}{k_e - g} \\ &= \frac{(1 - 0.70) 1.09}{0.125 - 0.09} = \frac{0.327}{0.035} = 9.34\end{aligned}$$

23. Answer : (c)

Reason : When the 100-day moving average line moves below the declining 300-day moving average line, a trend reversal is signaled which indicates a bearish signal. Hence, (c) is the correct answer.

24. Answer : (c)

Reason : Performance funds were set up in USA in 1960s to seek large profits from investment in high flying common stocks. The investment is made in buying equity shares of small unseasoned companies with relatively high price-earning ratio and higher price volatility. Clearly (I) and (III) are correct and (II) and (IV) are wrong. Hence (c) is the answer.

25. Answer : (b)

$$\begin{aligned}\text{Reason : Duration of stock} &= \frac{1}{k_e - g} \\ k_e &= 7 + 1.5 (10 - 7) \\ &= 7 + 4.5 = 11.5\% \\ \text{Duration} &= \frac{1}{0.115 - 0.04} \\ &= \frac{1}{0.075} = 13.33 \text{ years}\end{aligned}$$

26. Answer : (b)

$$\begin{aligned}\text{Reason : According to H-model } P_0 &= \frac{D_0 [(1 + g_n) + H(g_a - g_n)]}{r - g_n} \\ &= \frac{D_0 (1 + g_n)}{r - g_n} + \frac{D_0 H(g_a - g_n)}{r - g_n} \\ &= \text{Value based on normal growth rate} + \text{Premium due to abnormal growth rate} \\ \frac{D_0 H(g_a - g_n)}{r - g_n} &= \frac{3.00 \times 3 \times (0.8 - 0.04)}{0.125 - 0.04} \\ &= \frac{9 \times 0.04}{0.085} = \text{Rs.4.235}.\end{aligned}$$

27. Answer : (d)

Reason : The steeper the slope of the ex-ante SML, the more averse investors are in assuming additional risk. Those securities which plot above the ex-post SML are under priced whereas, overpriced securities plot below SML. Clearly (I), (III) and (IV) are correct, whereas (II) is not correct. Therefore, (d) is the answer.

28. Answer : (e)

Reason : Deep discount bond, zero coupon bond and a bond which pays a single cash flow will have duration equal to its maturity. This is because only one payment is made at the time of maturity and no cash flow will be available in intermediate periods.

29. Answer : (b)

Reason : After a slow expansion over a period, sometimes both prices and volume work into an exponential rise. This is indicative of heavy off-loading by bulls and is called a speculative blow off and marks the end of the bull market. Price and volumes both fall sharply after this development. Termination of a bull market is often signaled by a selling climax. A selling climax occurs when prices fall for a considerable time at an accelerated pace and are accompanied by expanding volume. Clearly (b) is correct while (a), (c) and (d) are wrong. Hence (b) is the answer.

30. Answer : (c)

Reason : A distribution accompanied by increased volume is a bearish factor and therefore, prices starts crashing. Hence (c) is the correct answer.

Part B: Problems

1. a We can calculate forward rates by calculating the price of zero coupon bonds

Maturity	YTM	Price	Forward rate
1	9	$\frac{1,000}{1.09} = 917.43$	—
2	10	$\frac{1,000}{(1.10)^2} = 826.45$	$\frac{(1.10)^2}{1.09} - 1 = 11.01\%$
3	11	$\frac{1,000}{(1.11)^3} = 731.19$	$\frac{(1.11)^3}{(1.10)^2} - 1 = 13.03\%$

- b. The next year's prices and yields can be calculated by discounting each zero's face value at the forward rates for the next year that we have calculated in part (a)

Maturity	Price	YTM
1 year	$\frac{1,000}{(1.1101)} = 900.82$	11.01%
2 year	$\frac{1,000}{(1.1101) \times (1.1303)} = 796.97$	12.01%

- c. Next year, the 2 year zero coupon bond will be 1-year zero coupon bond and will therefore sell at $\frac{1,000}{1.1101} = 900.82$. Similarly, the current 3-year zero coupon bond will be a 2-year zero and will sell at

$$\frac{1,000}{(1.1101) \times (1.1303)} = 796.97.$$

Expected total return

$$\text{2-year bond} = \frac{900.82}{826.45} - 1 = 9\%$$

$$\text{3-year bond} = \frac{796.97}{731.19} - 1 = 9\%$$

- d. The current price of the bond should equal the value of each payment times, the present value of Rs.1 to be received at the time of maturity. The present value can be calculated in the following manner:

$$\begin{aligned} & \frac{110}{(1.09)} + \frac{110}{(1.10)^2} + \frac{1110}{(1.11)^3} \\ &= 100.917 + 90.91 + 811.622 \\ &= \text{Rs.}1,003.45 \end{aligned}$$

Similarly, the expected price after 1 year can be calculated using forward rates.

$$\begin{aligned} & \frac{110}{(1.1101)} + \frac{1110}{(1.1101)(1.1303)} \\ &= 99.09 + 884.64 = 983.73 \end{aligned}$$

Total expected return

$$\left(\frac{110 + 983.73 - 1,003.45}{1,003.45} \right) = 9\%$$

2. a. Total risk = Systematic risk + Firm specific risk

Stock A

$$\begin{aligned}\text{Systematic risk} &= \beta^2 \sigma_m^2 \\ &= (0.75)^2 \times (22)^2 \\ &= 272.25 (\%)^2\end{aligned}$$

$$\text{S.D.} = 16.5(\%)$$

$$\text{Total risk} = \text{S.D.} = \sqrt{272.25 + (30)^2} = 34.24\%$$

Stock B

$$\begin{aligned}\text{Systematic risk} &= \beta^2 \sigma_m^2 \\ &= (1.10)^2 \times (22)^2 \\ &= 585.64 (\%)^2\end{aligned}$$

$$\text{S.D.} = 24.2\% (\%)$$

$$\text{Total risk} = \text{S.D.} = \sqrt{585.64 + (45)^2} = 51.09 \%$$

- b. Expected return of the portfolio

$$\begin{aligned}&= 0.25 \times 12 + 0.40 \times 16 + 0.35 \times 5 \\ &= 11.15\%\end{aligned}$$

$$\text{Total risk} = \text{Systematic risk} + \text{Unsystematic risk}$$

$$\begin{aligned}\text{Systematic risk of portfolio} &= (\text{Portfolio Beta})^2 \sigma_m^2 \\ &= 0.25 \times 0.75 + 0.40 \times 1.10 + 0.35 \times 0 \\ &= 0.6275\end{aligned}$$

$$\begin{aligned}\text{Systematic risk of portfolio} &= (0.6275)^2 \times (22)^2 \\ &= 190.578 (\%)^2\end{aligned}$$

$$\text{Systematic risk (S.D.)} = 13.805\%$$

$$\begin{aligned}\text{Non-systematic S.D. of portfolio} &= \sqrt{(w_1^2 \sigma_{e_1}^2 + w_2^2 \sigma_{e_2}^2 + w_3^2 \sigma_{e_3}^2)} \\ &= \sqrt{(0.25)^2 \times (30)^2 + (0.40)^2 \times (45)^2 + 0} \\ &= \sqrt{56.25 + 324} \\ &= \sqrt{380.25} \\ &= 19.50 (\%)\end{aligned}$$

$$\begin{aligned}\text{S.D. of portfolio} &= 13.805 + 19.50 \\ &= 33.305\%\end{aligned}$$

3. Monthly returns of HLL and Sensex are as follows:

Month	HLL (%)	Sensex (%)
November 01	–	
December 01	6.45%	0.77%
January 02	–1.32%	1.49%
February 02	13.19%	5.78%
March 02	–9.79%	–0.94%
April 02	–10.01%	–3.78%
May 02	–8.85%	–6.36%
June 02	4.87%	3.81%
July 02	–11.79%	–7.92%
August 02	9.18%	6.48%
September 02	–7.53%	–5.97%
October 02	–7.15%	–1.41%

Now, using the equation given in the question, we calculate expected return as per characteristic line.

Month	Actual return (A)	Expected return (B) $2.50 + 0.75 \times r_{mt}$	Abnormal return (A – B)
December 01	6.45%	$2.50 + 0.75 \times 0.77 = 3.0775\%$	3.3125%
January 02	–1.32%	$2.50 + 0.75 \times 1.49 = 3.6175\%$	–4.9375%
February 02	13.19%	$2.50 + 0.75 \times 5.78 = 6.835\%$	6.355%
March 02	–9.79%	$2.50 + 0.75 \times (–0.94) = 1.795\%$	–11.585%
April 02	–10.01%	$2.50 + 0.75 \times (–3.78) = –0.335\%$	–9.675%
May 02	–8.85%	$2.50 + 0.75 \times (–6.36) = –2.27\%$	–6.58%
June 02	4.87%	$2.50 + 0.75 \times 3.81 = 5.3575\%$	–0.4875%
July 02	–11.79%	$2.50 + 0.75 \times (–7.92) = –3.44\%$	–8.35%
August 02	9.18%	$2.50 + 0.75 \times 6.48 = 7.36\%$	1.82%
September 02	–7.53%	$2.50 + 0.75 \times (–5.97) = –1.9775\%$	–5.5525%
October 02	–7.15%	$2.50 + 0.75 \times (–1.41) = 1.4425\%$	–5.7095%
			–33.735%

From the above computation, we observe that sum of abnormal return is not close to zero. Therefore, we conclude that market is not efficient in semi-strong form.

4. EPS = 6.5 Payout rate = 75%

$$DPS = 0.75 \times 6.5 = 4.875$$

$$\text{Beta} = \frac{\text{COV}_{im}}{\sigma_m^2} = \frac{175}{(12.5)^2} = 1.12$$

$$\text{Required rate of return} = 5 + 1.12 (12 - 5)$$

$$= 12.84\%$$

Value of stock can be calculated using H Model

$$V_0 = D_0 \left[\frac{(1 + g_n) + H(g_a - g_n)}{K_e - g_n} \right]$$

$$= 4.875 \left[\frac{(1 + 0.11) + 4(0.22 - 0.11)}{0.1284 - 0.11} \right]$$

$$4.875 \left[\frac{(1.11) + 0.44}{0.0184} \right] = \text{Rs.}410.67$$

5. a. Duration of liability

Year	C.F	PV. of C.F (12%)	PV. of C.F. x n
1	25.50	22.7715	22.7715
2	19.25	15.3422	30.6844
3	18.25	12.9940	38.982
4	17.50	11.1300	44.5200
5	19.50	11.0565	55.2825
6	17.50	8.8725	53.235
		82.1667	245.4754

$$\text{Duration of liability} = \frac{245.4754}{82.1667} = 2.9875 \text{ years}$$

Duration of bond X

$$\frac{rc}{rd} \times \text{PVIFA}(rd, n) (1 + rd) + \left(1 - \frac{rc}{rd} \right) n$$

rd

$$\text{YTM } 966.38 = 110 \times \text{PVIFA}(K, 5) + 1050 \times \text{PVIF}(K, 5)$$

$$\text{at } 12\% = 991.9$$

$$\text{at } 11\% = 956.88$$

$$\text{YTM} = 12 + \frac{991.9 - 966.38}{991.9 - 956.88}$$

$$12 + \frac{25.52}{35.02} = 12.72\%$$

$$rd = 12\% \text{ (Approx)}$$

$$rc = \frac{110}{966.38} = 11.38\%$$

$$D = \frac{0.1138}{0.12} \text{PVIFA}(12, 5) (1.12) + \left(1 - \frac{0.1138}{0.12} \right) 5$$

$$0.9983 \times 3.6047 \times 1.12 + 0.2583$$

$$= 4.087 \text{ years}$$

$$rd = 12\%$$

Duration of bond Y

$$rc = \frac{130}{988.66} = 0.1315$$

$$D = \frac{0.1315}{0.12} \text{PVIFA}(12, 3) (1.12) + \left(1 - \frac{0.1315}{0.12} \right) 3$$

$$1.09583 \times 2.402 \times 1.12 - 0.2875$$

$$= 2.66054 \text{ years}$$

Proportion to be invested

$$W_1 = \text{Bond X}$$

$$W_2 = \text{Bond Y}$$

$$W_1 \times 4.087 + W_2 \times 2.66054 = 2.9875$$

$$W_1 \times 4.087 + (1 - W_1) \times 2.66054 = 2.9875$$

$$2.66054 + 1.42646 W_1 = 2.9875$$

$$W_1 = \frac{0.32926}{1.42646} = 0.2292$$

$$W_2 = 1 - 0.2251 = 77.08\%$$

Proportion to be invested in bond X = 22.51%

Proportion to be invested in bond Y = 77.08%

- b. After 1 year liability will be 5 year liability and 4 year and 3 year coupon bond will become 3 year and 2 year bonds respectively. As the interest rate changes their duration will also change.

Duration of liability

Year	C.F	P.V. of C.F.	
1	19.25	16.8822	16.8822
2	18.25	14.0342	28.0684
3	17.50	11.8125	35.4375
4	19.50	11.544	46.176
5	17.50	9.0825	45.4125
		63.3554	171.9766

$$\text{Duration} = \frac{171.9766}{63.3554} = 2.714 \text{ year}$$

- c. Duration of bond X

Expected Price of the bond X one year hence

$$= 110 \times \text{PVIFA}(14, 4) + 1,050 \times \text{PVIF}(14, 4)$$

$$= 942.14$$

$$rc = \frac{110}{942.14} = 0.11675$$

$$\frac{0.11675}{0.14} \times \text{PVIFA}(14, 4) (1.14) + \left(1 - \frac{0.11675}{0.14}\right) 4$$

$$= 2.7702 + 0.6643$$

$$= 3.4345 \text{ years}$$

Duration of bond Y

Expected Price of the bond Y one year hence

$$= 130 \times \text{PVIFA}(14, 2) + 950 \times \text{PVIF}(14, 2)$$

$$= 944.66$$

$$rc = \frac{130}{944.66} = 0.1376$$

$$\frac{0.1376}{0.14} \times \text{PVIFA}(14, 2) (1.14) + \left(1 - \frac{0.1376}{0.14}\right) 2$$

$$= 1.8454 + 0.34285$$

$$= 1.879685 \text{ years}$$

$$= 1.88 \text{ years approximately}$$

$$3.4345 W_1 + 1.88 W_2 = 2.714$$

$$3. 4345W_1 + 1.88(1 - W_1) = 2.714$$

$$3. 4345 W_1 + 1.88 - 1.88W_1 = 2.714$$

$$1.5545 W_1 = 2.714 - 1.88$$

$$W_1 = \frac{0.834}{1.5545} = 0.5365$$

$$W_2 = 0.4635.$$

Therefore, adjustment required is investment in bond X should be increased from 22.92% to 53.65% and bond Y decreased by 77.08% to 46.35%.

6. i. For short-period observation, A/D lines do not account for unchanged stocks.

Day	Issues traded	Advance (A)	Declines (B)	Net (A – D)	Cumulative A – D
1	199	96	96	0	0
2	199	140	53	87	87
3	199	120	75	45	132
4	199	79	115	–36	96
5	199	102	88	14	110
6	199	99	95	4	114
7	199	90	102	–12	102

- ii. Long-period A – D line:

For long run observations, the A – D line is drawn after considering the number of issues also whose price remain unaltered. The A – D line is drawn by cumulative the value of $\sqrt{\frac{A}{U} - \frac{D}{U}}$

where,

A = No. of issues whose prices are advancing

D = No. of issues whose prices are declining

U = No. of stocks whose prices remains unaltered.

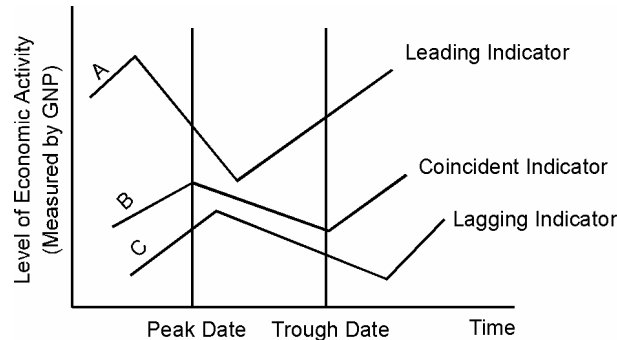
Day	Issues traded	Advance	Declines	Unchanged	$\frac{(2)}{(4)} \times 100$	$\frac{(3)}{(4)} \times 100$	(5 – 6)	$\sqrt{7}$	Cumulative A – D
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	199	96	96	7	1371.43	1371.43	0	0	0
2	199	140	53	6	2333.33	883.33	1450	38.07	38.07
3	199	120	75	4	3000.00	1875.00	1125	33.54	71.61
4	199	79	115	5	1580.00	2300.00	–720	–26.83	44.78
5	199	102	88	9	1133.33	977.78	155.55	12.47	57.25
6	199	99	95	5	1980.00	1900	80.00	8.94	66.19
7	199	90	102	7	1285.71	1457.14	–171.43	–13.09	53.10

Part C: Applied Theory

7. The important forecasting techniques are:

a. Leading Indicator approach

The lead indicator approach attempts to forecast the general economic conditions by identifying economic indicators that turn ahead of the change in the general level of economic activity. Economic indicators are nothing but time series which tend to turn up or down in advance of or concurrent with, or after the economic upturn or downturn. From figure given below, we find that indicator A turns ahead of the peak and trough of the business cycle whereas indicators B and C turn in unison with or after the peak and trough of the cycle.



So, to forecast the change in the economic conditions, we will be obviously interested in leading indicators because they provide advance signals of the turning points in the economic activity.

While identifying a lead indicator for the purposes of forecasting, the analyst must ensure that the lead indicator fulfills the following criteria as closely as possible: (1) It should move smoothly from one period to another as it rises or falls and should turn sharply at its peaks and troughs. If a series zigzags during its upward or downward swings, it becomes difficult to know whether the 'zig' is a genuine turning point or a temporary reversal of trend. (2) An ideal lead indicator should always lead turning points of general business activity by the same number of months with no 'false' leads. (False leads are predictions of business turning points which do not materialize). (3) It should lead by enough time to permit the user to make necessary alterations in his plans, but do not lead by a long- time interval that will make him disbelieve the indicator. (4) The indicator should fit logically with the business cycle theory. The more logical it appears that a particular series will turn ahead of economic conditions, the more assured the user can be that its historical lead relationship will continue in the future.

Some of the leading economic indicators are the utilization of manufacturing capacity, residential construction, corporate profits, and of course the general level of stock prices. Since the movement in the general level of stock prices is what we are ultimately interested in forecasting, we should look for that leading indicator which would act as a lead to the leading indicator under consideration.

The lead indicator approach is most valuable in suggesting the direction of change in economic activity. But it does not convey any information on the magnitude and duration of the change. The other important limitation of this approach is that the signals provided by the different lead indicators can be mixed. In other words, some of the leading series might signal a turn while the others might not, resulting in a serious problem of interpreting the same for the purpose of arriving at a forecast.

This limitation can of course be resolved by shortlisting only such lead indicator(s) that satisfy the criteria mentioned above. The diffusion index approach discussed in the next section partly attempts to resolve the problem of mixed signals.

b. Diffusion Indices

A diffusion index (as the name implies) is a measure of how widespread (diffused) a phenomenon is. We can set up a diffusion index for leading indicators by counting the number of indicators that rise during a particular period and expressing it as a proportion of the total number of lead indicators and more desirably in a percentage form. If five out of, say, ten leading indicators rise during a particular month, the diffusion index for that month will be 50 percent. If, in the next month, seven rise (not necessarily including all the five which rose in the previous month), the index for that month will be 70 percent. The user must interpret the diffusion index relative to the levels of the index in the past. Certainly a rise from 50% to 70% in the index is a stronger confirmation of a period of economic advance.

c. Econometric Model Building Approach

As far as short-term economic forecasting is concerned, an approach based on econometric methods has the advantage of providing a magnitude and direction to the dependent variable (unlike the lead indicator approach), say GNP. However, the user must understand that a precise estimate of the dependent variable (forecast value for GNP) obtained from the econometric model need not be an accurate one, because accuracy of the forecast will ultimately depend upon the quality of data input, the validity of the assumptions underlying the model, and above all upon the model builder's understanding of the underlying economic theory.

Further, as stated in the Indian context it must be noted that, an econometric model for forecasting GNP in a planned economy may not have much of a practical relevance because the planning priorities may change significantly, besides the likely changes in government regulation, fiscal policy, and the control mechanisms of money, credit, prices and wages. Econometric models can be meaningful for future projections if and only if the estimated co-efficients (like the intercept 'a' and slope 'b' in a linear regression model) are found to be acceptable in respect of their stability over time.

d. GNP Model Building Approach

The GNP model building approach forecasts GNP in the short-run by estimating the magnitudes of the various components constituting GNP. If GNP is defined as $C + I + G + X - M$ where C, I, G, X and M stand for their standard definitions, then forecast for GNP under this approach is determined by estimating the likely values of C, I, G, X and M. To estimate these components, the forecaster relies extensively on the budget estimates of the Central and State Governments, the socio-economic surveys carried out by the Government and private agencies, and the field data collected for this purpose.

Once the forecaster estimates these major components, he adds them together to come up with his estimate of the GNP. He tests the forecast for internal consistency because of the interrelatedness of the GNP accounts. For example, a given level of consumption implies a certain level of savings, which affects business investments which in turn affects production activities, and thus affects income and savings.

While these circular effects take place, other factors like interest rates and inflation will also be affected. So, the forecaster must ensure that his estimates for the different components take care of such interlinkage. Apart from testing the forecast for internal consistency, the forecaster also examines it for external consistency by comparing it with forecasts obtained under other methods like the econometric model building approach.

The major advantage of this approach is its versatility. Since the GNP forecast is adjusted for all anticipated changes and tested for internal consistency, it is likely to be a reliable one. But the approach is data demanding and calls for a vast deal of judgment and ingenuity. The approach has been succinctly described by Lewis and Turner as 'an effort to build a view of the short-run business outlook that is comprehensive, that is as quantitatively precise as the state of our knowledge permits, that is internally consistent, that draws upon rather than sidesteps all the pertinent insights of modern aggregative economics but, at the same time, does not make a fetish of the theoretical rigor. Instead, the technique seeks to exploit any and all evidences of business prospects that may come to hand. It is particularly distinguished from pure econometric model building by its heavy use of data concerning the advance plans and commitments of certain spending groups, and it retains a sizeable place for judgment and free-hand adjustments'.

8. a. Triangles are commonly used to identify reversals and consolidation but are not very reliable formations. There are two types of triangle formations – symmetrical and right-angled.

A symmetrical triangle is formed when, in a series of rallies, each succeeding one peaks at a lower level than the preceding peaks, and the bottoms of the intervening relations is progressively higher. The lines joining the peaks and bottoms of such a formation converge. When prices breakout of a symmetrical triangle, the reversal is generally sharp. Volumes reduce as the triangle narrows towards the apex. When the breakout occurs between the half and three-fourths of the distance between the widest peak and rally, and the apex, the information is said to be a highly reliable indicator of a reversal. It is, however, not known before the breakout as to whether the triangle is a continuation pattern or a reversal pattern.

A right-angled triangle is also formed when a series of rallies converge, but with an important difference. One of the two boundaries of the series is horizontal to the X-axis. In a right angled triangle, since the resistance or support level is implied in its formation, the direction of breakout can be identified even before the actual breakout. However, sometimes a right-angled triangle develops into a rectangle, thus making such identification difficult. The validity of the breakout is measured by drawing a line parallel to the slopping side of triangle (hypotenuse) through the first rally or reaction.

- b. Stochastics is a price velocity technique based on the theory that as prices increase, closing prices have a tendency to be ever nearer to the peaks reached during that period. Similarly, as prices tend to fall, closing prices tend to be closer and closer to the troughs reached during that period. This approach was developed by George C. Laire.

Calculation of Stochastics based on the simple formula that follows:

$$\% K = \frac{C - L}{H - L} \times 100$$

% K is Stochastics

C is the latest closing price

L is the low price during the last N periods

H is the high price during the last N periods

N can be any number of periods. Laire suggests 5 to 21 periods

% K is then smoothened to derive % D by using the simple moving average technique.

When plotted, the resultant lines will show where the closing price is relative to the range of prices for a given period of time (N).

- c. If a vertical rally or decline is interrupted by a consolidation pattern akin to a rectangle, such a formation is called a flag. After the flag formation prices move in the same direction as before. Flags only represent a pause in rally or reaction before prices continue in their course. Flags may be horizontal, though it has been found that flags in a rising market are formed with a slight downtrend, and flags in a falling market have a slight uptrend.

Volume is generally very high as the flag begins to form and tapers off when the formation is complete. When the prices breakout of the flag, a sudden increase in volume can be noticed. In a rising market, bullish traders may pause to register gains in the course of an uptrend that is particularly sharp, causing a flag formation in prices.

A flag formation in a declining market is marked by falling volumes. Since a flag in a downtrend in price means a series of minor rallies, analysts who watch the increase in prices accompanied by falling volumes, identify the ensuing bear market. When prices breakout, the downtrend in prices continues. Volumes accompanying a downward breakout are not very high as in the case of a flag formed in an uptrend.