

Question Paper
Fixed Income Securities: Analysis & Valuation (CFA620) : July 2008
Section A : Basic Concepts (30 Marks)

- This section consists of questions with serial number 1 - 30.
- Answer all questions.
- Each question carries one mark.
- Maximum time for answering Section A is 30 Minutes.

1. A corporate bond investor is always exposed to credit risk. Credit risk can be classified into [<Answer](#)
≥
- (a) Credit swap risk, reinvestment risk and downgrade risk
 - (b) Default risk, reinvestment risk and call risk
 - (c) Downgrade risk, credit swap risk and call risk
 - (d) Default risk, credit spread risk and downgrade risk
 - (e) Prepayment risk, reinvestment risk and downgrade risk.
2. After witnessing much volatility in equity market, Mr.Subh, an equity investor is planning to invest in fixed income securities but at same time aims at minimizing interest rate risk. Which among the following securities would serve the purpose of Mr.Subh? [<Answer](#)
≥
- (a) Zero coupon bonds
 - (b) Long term government bonds
 - (c) Callable bonds
 - (d) Long term corporate bonds
 - (e) Short term treasury bills.
3. If 182-day T-bill is quoted at Rs.96.58, the yield is [<Answer](#)
≥
- (a) 6.20%
 - (b) 6.50%
 - (c) 6.80%
 - (d) 7.10%
 - (e) 7.40%.
4. Which of the following statements is **correct** with respect to '7.8% GoI 2015' bond issued in the year 2007? [<Answer](#)
≥
- (a) It denotes a bond with a yield to maturity of 7.8% issued by the Government of India with coupon payable annually and maturing in the year 2015
 - (b) It denotes a bond with a coupon rate of 7.8% issued by the Government of India with a residual maturity of 15 years
 - (c) It denotes a bond with a coupon rate of 7.8% issued by the Government of India with coupon payable semi annually and maturing in the year 2015
 - (d) It denotes a bond with a coupon rate of 7.8% issued by the Government of India with coupon payable annually and coupon payment starting from the year 2015
 - (e) It denotes a bond with a coupon rate of 7.8% issued by the Government of India with coupon payable annually and maturing in the year 2015.
5. On July 1, 2008, Mr.Piyush purchased a zero-coupon bond at Rs.850. The face value of the bond is Rs.1,000 and it matures in two years. If the implied yield on the bond for the first year is 9%, the same for the second year will be [<Answer](#)
≥
- (a) 6.50%
 - (b) 7.00%
 - (c) 7.93%
 - (d) 8.00%
 - (e) 8.53%.

6. The interest rate the dealer agrees to pay in a repurchase agreement is known as repo rate. This rate varies from transaction to transaction and depends upon variety of factors. In this regard, which of the following statements is **not true**? [<Answer](#)
≥
- If the collateral is of high quality securities and is highly liquid, a lower repo rate is charged
 - If the collaterals are delivered to lender, the repo rates would be lower
 - Repo rates are usually lower than the central bank's fund rates
 - The maturity of the collateral negatively affects the repo rate
 - Repo rates would be low when the collaterals to the loan are hot collateral.
7. Mr. Ankur is managing a bond portfolio of Rs.2.5 million. His target duration is 9 years and he is planning to include zero coupon bonds of 6 year maturity and 10 year maturity in his portfolio. The proportions of investments to be made in each bond respectively to achieve target duration are [<Answer](#)
≥
- 0.43 and 0.57
 - 0.31 and 0.69
 - 0.25 and 0.75
 - 0.14 and 0.86
 - 0.09 and 0.91.
8. Which of the following bonds has the lowest duration? [<Answer](#)
≥
- A bond with a coupon payment @ 9% per annum and 11 year term to maturity
 - A bond with a coupon payment @ 11% per annum and 9 year term to maturity
 - A bond with a coupon payment @ 9% per annum and 10 year term to maturity
 - A bond with a coupon payment @ 9% per annum and 9 year term to maturity
 - A bond with a coupon payment @ 10% per annum and 11 year term to maturity.
9. Mr. Vivek purchased 'BB' rated debentures issued by JetCorp at Rs.1,800 for a period of one year. The face value of each debenture is Rs.1,500. After one year, the price of the debenture turns out to be Rs.2,000. If holding period return to Mr. Vivek is 20%, the coupon rate being offered by such debenture is [<Answer](#)
≥
- 6.67%
 - 7.33%
 - 8.67%
 - 9.33%
 - 10.67%.
- 10 The Monte Carlo simulation model is used to value [<Answer](#)
≥
- Zero coupon bonds
 - Asset-backed securities
 - T-Bills
 - Commercial Papers
 - Bills of Exchange.
- 11 A bond's duration equals the bond maturity when [<Answer](#)
≥
- The bond's coupon rate equals the market interest rate
 - The bond's quality rating does not change during its tenure
 - The coupon is paid only once during the tenure of the bond
 - The bond pays no coupon
 - The coupon on bond is paid annually.
- 12 Gourmet Ltd. recently issued 10-year bonds with a face value of Rs.1,000 each. Each bond carries a coupon rate of 9.75% p.a. and pays interest semi-annually. The bonds are callable in 6 years at 10% premium to face value. If the current market price of the bond is Rs.1025, the yield to call is approximately [<Answer](#)
≥
- 9.95%
 - 10.42%
 - 11.23%
 - 12.56%
 - 13.01%.

13 Which of the following risks is/are eliminated by bond immunization?

[<Answer](#)

[≥](#)

- I. Default risk.
- II. Market risk.
- III. Interest rate risk.
- (a) Only (II) above
- (b) Only (III) above
- (c) Both (I) and (II) above
- (d) Both (I) and (III) above
- (e) Both (II) and (III) above.

14 On July 01, 2004 Max India issued 12% convertible bonds with a face value of Rs.1,000 convertible into equity shares of the company after four years. On July 01, 2008, the premium over conversion value offered by such bond is 20% and the prices of the convertible bond and equity share of the company are Rs.1,200 and Rs.50 respectively. The conversion rate offered by such bond issue is

[<Answer](#)

[≥](#)

- (a) 8 shares
- (b) 16 shares
- (c) 20 shares
- (d) 25 shares
- (e) 28 shares.

15 In the year 2008, if the yields to maturity (YTM) of a '6.85% GoI 2012' bond and '6.75% GoI 2011' bond are 7.5% and 7% respectively, the implied 1 year yield on '6.85% GoI 2012' bond after 3 years is

[<Answer](#)

[≥](#)

- (a) 7.15%
- (b) 7.75%
- (c) 8.15%
- (d) 8.53%
- (e) 9.01%.

16 Treasury securities are very liquid and are heavily traded in the secondary market. Which of the following treasury securities do **not** involve coupon payment?

[<Answer](#)

[≥](#)

- (a) Treasury Notes
- (b) Treasury Bonds
- (c) Treasury Bills
- (d) Treasury Inflation-Protected Securities
- (e) Long Bonds.

17 Which of the following statements with respect to Option-Adjusted Spread (OAS) is/are **true**?

[<Answer](#)

[≥](#)

- I. It is the spread at which it presumably would be trading over a benchmark, if it had no embedded option.
- II. The value of option adjusted spread analysis enables investors to judge the degree to which an instrument's yield compensates them for credit risk, liquidity risk or other such factors.
- III. The investor would prefer to purchase the bond that has higher option-adjusted spread.
- (a) Only (I) above
- (b) Only (II) above
- (c) Both (I) and (III) above
- (d) Both (II) and (III) above
- (e) All (I), (II) and (III) above.

18 With a view to securing the debt repayment obligation, Sahara Petroleum opted for Graduated-Payment Mortgage (GPM) Scheme. In this context, which of the following statements would support the characteristics of such a mortgage scheme?

[<Answer](#)

[≥](#)

- I. GPM is a form of traditional mortgage where some portion of down payment is required.
- II. The payments under GPMs start at a relatively low level and rise for a specified number of years after which they become equal.
- III. GPMs are usually preferred by young first-home buyers.
- (a) Only (I) above
- (b) Only (III) above
- (c) Both (I) and (II) above
- (d) Both (II) and (III) above
- (e) All (I), (II) and (III) above.

19 Mr. Vinamr is of the view that, in the falling interest rate scenario, investment in mortgage-backed or asset backed security is more risky. Which of the following statements will justify his opinion? [<Answer](#)
≥

- I. Price risk is more as mortgage-backed or asset backed security exhibits a positive relationship between yield and price of the bond.
 - II. Call risk will be more because in the declining interest rate scenario, the probability that the issuer will call back the security is high.
 - III. Reinvestment risk will be more as reinvestment of coupon payments is likely to be at lower rate.
- (a) Only (I) above
 - (b) Only (II) above
 - (c) Only (III) above
 - (d) Both (II) and (III) above
 - (e) All (I), (II) and (III) above.

20 Which among the following situations, may be referred to as 'loose money policy'? [<Answer](#)
≥

- (a) Inflation is at peak
- (b) Economy is overheated
- (c) There is a low interest rate prevailing in the economy
- (d) Government is thinking of cutting down the consumption
- (e) Less demand prevails for luxury goods.

21 Despite the fall in the demand for puttable bond in the falling interest rate regime, Mr. Agarwal purchased 100 convertible bonds of Ugar Ltd. with put options. The maturity of these bonds is 5 years. The terms of the bond provided for soft puts exercisable within three years from the date of issue. This implies that the issuer has [<Answer](#)
≥

- (a) To compulsorily exercise the put option in case the interest rate continues to decline
- (b) To redeem the convertible security only for cash
- (c) The option to exercise the convertible security after three years but before five years from the date of issue, if the investor so desires
- (d) Greater expectation that the option will be exercised by the investor in the near short - term period
- (e) The option to redeem the convertible security for cash, common stock, subordinated notes, or for a combination of the three.

22 Mr. Avinash, a fund manager of bond mutual fund scheme is managing a portfolio, the initial worth of which is Rs.1 crore. The face value of each unit of the scheme is Rs.10. The number of units outstanding in the scheme is 10 lakhs. The portfolio consists of the investment in the following bonds: [<Answer](#)
≥

Bond	Remaining Years to Maturity	YTM (%)	Face Value (Rs.)
10% HCL bond	3	11	1,000
11% RDS bond	3	11	5,000

If the portfolio has of 5,000 bonds issued of HCL and 1000 bonds of RDS, the current NAV of each unit of the scheme is

- (a) Rs. 9.88
- (b) Rs.10.00
- (c) Rs.10.95
- (d) Rs.11.25
- (e) Rs.11.95.

23 While commenting on the use of different kinds of bonds, Mr. Robert made a special emphasis on Ratchet bonds. Which of the following statements best describes a Ratchet bond? [<Answer](#)
≥

- (a) The coupon rate in this bond is a fixed rate plus the difference between two reference rates
- (b) The coupon rate of this bond is adjusted periodically at a fixed margin over a reference rate
- (c) The coupon rate of this bond can be adjusted both southward and northward
- (d) The coupon rate of this bond always moves in the same direction as the reference rate
- (e) The coupon rate of this bond is computed as a fraction of the reference rate plus a quoted margin.

- 24 On April 1, 2006, Cisco Ltd. issued 9.5% CISCO 2009 AA+ rated bonds. On April 01, 2007, the bond was trading at a discount of 7.5% and on April 01, 2008, it was trading at a discount of 4.5%. The possible reason(s) for change in the price of the bond is/are [<Answer](#)
≥
- I. Change in the credit quality of the issuer over the period of time.
 - II. As the bond approaches maturity, the price of the bond moves towards its face value.
 - III. The changes in the yields of comparable bonds/securities.
 - IV. As the bond approaches maturity date, it is most likely to face the problem of liquidity.
- (a) Only (II) above
 - (b) Both (I) and (III) above
 - (c) Both (II) and (IV) above
 - (d) (I), (II) and (III) above
 - (e) All (I), (II), (III) and (IV) above.
- 25 Which of the following strategies believes in Efficient Market Hypothesis (EMH)? [<Answer](#)
≥
- (a) Ladder strategy
 - (b) Barbell strategy
 - (c) Bullet strategy
 - (d) Yield spread strategy
 - (e) Passive strategy.
- 26 During the year 2008, Mr.Alex bought 10%, ICICI 2013 bond with a face value of Rs.1,000 when the yield to maturity (YTM) was 11%. If after one year, YTM turns out to be 9%, the capital gain /(loss) to Mr.Alex on his investment of 10 bonds will be [<Answer](#)
≥
- (a) Rs. 389.0
 - (b) Rs. 693.5
 - (c) Rs.1002.5
 - (d) Rs.(365.0)
 - (e) Rs.(324.0).
- 27 Which of the following statements is/are **true** with respect to effective duration? [<Answer](#)
≥
- I. It is duration for bonds with embedded options.
 - II. It does not take into account the discounting at different interest rates.
 - III. It can be estimated using modified duration, if the bond with embedded options behaves like an option free bond.
- (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.
- 28 Which of the following statements is/are **true** with respect to the debt structure of high-yield bonds? [<Answer](#)
≥
- I. High-yield issuer would rely less on bank loan because its high credit rating makes it more attractive investment for other creditors.
 - II. Inclusion of broker loans or reset loan into the debt structure is of a concern to the bondholders.
 - III. Presence of deferred coupon bonds in the debt structure implies that the future cash flows would be affected by this obligation.
- (a) Only (I) above
 - (b) Only (III) above
 - (c) Both (I) and (II) above
 - (d) Both (II) and (III) above
 - (e) All (I), (II) and (III) above.

29 Mr. Agarwal has invested in a mortgage-backed security issued by HDFC Bank. His total monthly cash flows from such a security would comprise of

<Answer>
≥

- I. Gross interest coupon payments.
- II. Monthly interest payment net of servicing and other fees.
- III. Scheduled principal payment for each month.
- IV. Forecasted unscheduled principal repayments in each month (prepayments).

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

30 Which of the following statements is true?

<Answer>
≥

- (a) If market price = face value, coupon rate = current yield > yield to maturity
- (b) If market price = face value, coupon rate < current yield = yield to maturity
- (c) If market price < face value, coupon rate > current yield > yield to maturity
- (d) If market price < face value, coupon rate = current yield = yield to maturity
- (e) If market price > face value, coupon rate > current yield > yield to maturity.

END OF SECTION A

Section B : Problems/Caselet (50 Marks)

- This section consists of questions with serial number 1 – 5.
- Answer all questions.
- Marks are indicated against each question.
- Detailed workings/explanations should form part of your answer.
- Do not spend more than 110 - 120 minutes on Section B.

1 Huge volatility in Indian equity market in recent times due to the weak global market sentiments on account of high crude prices and high inflation, have forced Mr. Ankit, an equity investor to look out for other avenues of investments. One such investment avenues available to him are fixed income securities in debt market. However, the return that he desires by investing in this market depends on the credit risk associated with the debt instruments. Accordingly, he has identified the following three bonds for his investment purpose to select one among them:

<Answer>

Bond	Credit Rating	Required Rate of Return of Mr. Ankit
HDFC2012	AAA	364-day T-bill rate +2.5% spread
PGC2012	AA	364-day T-bill rate +3.5% spread
IRFC2012	A	364-day T-bill rate +4.5% spread

Other details with respect to the above three bonds are as follows:

Bond	Current Market Price (Rs.)	Coupon rate (%)	Redemption
HDFC2012	1015.00	10.25	At par
PGC2012	1025.00	10.75	At 7.5% premium to face value
IRFC2012	1085.00	11.00	At 12.5% premium to face value

The face value of each of the bonds is Rs.1,000 and they have 4 years remaining to maturity. The next coupon payments on the bonds are due after one year from today. Currently, 364-day T-bills are trading at Rs.93.04 each.

You are **required** to:

- a. Compute the value of the above bonds and suggest the bond to be selected by Mr. Ankit for his investment purpose. **marks**
(8)
- b. Calculate the current yield and the yield to maturity (YTM) of the bond suggested in (a) above. **marks**
(3)

[<Answer>](#)

[≥](#)

2 Mr. Sumit, a portfolio manager of a pension fund estimates that there will be annual cash outflows of Rs.50,000 for a period of five years, the first payment of which will commence from the end of second year from now. There is also an additional cash outflow of Rs.1,20,000 at the end of sixth year from now. The cost of debt for similar liabilities in the market is 11%.

Mr. Sumit is considering immunizing the cash flows by investing in two bonds i.e., Vivek Steel & Forgings Ltd. (VSF) bond and SIDBI Deep Discount bond. The particulars of both the bonds are as follows:

The bond of Vivek Steel & Forgings Ltd (VSF) is a 9% coupon bearing bond with a face value of Rs.100, maturing after 6 years, redeemable at a premium of 10% and is currently trading at Rs.101.30. Interest is payable annually.

SIDBI Deep Discount bond is a bond with a face value Rs.2500 maturing after 4 years and is currently trading at Rs.1415.

You are **required** to determine the proportion of funds to be invested by Mr. Sumit in the VSF bond and SIDBI Deep Discount bond such that his liabilities are immunized. **1 marks**
(0)

[<Answer>](#)

3 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, you are **required** to

- Calculate the implied one-year forward rates and prices of the zero coupon bonds having a face value of Rs.1000. **marks**
(6)
- Compute your expected total returns on two-year and three-year zero coupon bonds, if you have purchased these two bonds today and sold after a year. **marks**
(4)

Caselet

Read the caselet carefully and answer the following questions:

4 As per the caselet, investors in fixed income investments bear inflation risk where the purchasing power of interest payments could be eroded. In this context, explain the various risks that are associated with investing in bonds. **1 marks**
(0)

[<Answer>](#)

5 As per the caselet, IPSs have a low correlation with other types of asset classes which helps potentially reduce overall portfolio volatility. In this context, discuss whether IPSs should be a part of every balanced portfolio or not. **marks**
(9)

[<Answer>](#)

With normal (or nominal) fixed-income investments, investors bear inflation risk where the purchasing power of interest payments could be eroded by inflation over and above their original expectations. Inflation-protected securities (IPSs) such as Treasury inflation-protected securities (TIPSs), however, are guaranteed to keep pace with inflation as defined by the Consumer Price Index (CPI). If you buy a conventional Treasury, you receive the same interest payment semiannually for the life of the bond. With TIPSs, the Treasury adjusts the principal value of a bond each month (with a two-month lag time) to keep pace with inflation. A higher principal value also lifts interest payments. This is what makes them unique and defines their behavior. The addition of inflation protected securities to an investor's portfolio can have a positive impact on performance while reducing overall risk. Such securities have a low correlation with other types of asset classes which helps to potentially reduce overall portfolio volatility. Moreover, IPSs add value to an investor's portfolio by safeguarding long-term purchasing power, providing a better hedge than traditional inflation hedges and providing superior diversification since IPSs perform well in varied market environments.

The role that TIPSs played in a diversified bond portfolio got a big boost in 2007. As many investors labored to eke out gains amid crumbling credit markets, the stars aligned for inflation-indexed bonds, and the Lehman Brothers TIPSs index returned an impressive 11.7%.

Three developments drove returns. First, TIPSs benefited from a flight to quality. Second, a slowing economy and interest-rate cuts by the Federal Reserve boosted results. Finally, inflation (and expectations of further inflation) rose. TIPS are indexed to the consumer price index, which

surged from 2% at the start of 2007 to 4% by year's end, mainly because of rising oil and food prices.

Despite their advantages, investors should understand that IPSs aren't absolutely risk-free. IPSs are subject to interest rate risk. However, because IPSs have better price protection through inflation adjustments, they tend to perform well in a rising rate environment if rates increase due to inflation. If interest rates were to rise and we saw a decline in inflation, it could create an environment where IPSs could underperform. As with most investments, one needs to understand the tax picture before investing. Individual IPS is taxed similarly to zero coupon Treasury bonds. The inflation adjustment is taxable in the year it occurs even though the investor won't receive the additional principal until the bond matures. The investor is in effect responsible for paying taxes on income which they have yet to reap the benefits.

END OF CASELET

END OF SECTION B

Section C : Applied Theory (20 Marks)

- | |
|--|
| <ul style="list-style-type: none">• This section consists of questions with serial number 6 - 7.• Answer all questions.• Marks are indicated against each question.• Do not spend more than 25 - 30 minutes on Section C. |
|--|

6. From the investor's perspective, callable bond has certain disadvantages. In this context, explain the concept of callable bond. Also discuss the disadvantages of such bonds to an investor. [<Answer>](#)
(10 marks)

7. Securitization refers to conversion of illiquid assets to liquid assets by converting longer duration cash flows into shorter duration ones. In this context, discuss the various steps involved in the process of Securitization. [<Answer>](#)
(10 marks)

END OF SECTION C

END OF QUESTION PAPER

Suggested Answers

Fixed Income Securities: Analysis & Valuation (CFA620) : July 2008

Section A : Basic Concepts

- | Answer | Reason |
|---------------|---|
| 1. D | A bond investor is always exposed to credit risk. Credit risks can be classified into <TOP> three types. They are :- <ul style="list-style-type: none">• Default risk Credit Spread risk

Downgrade risk. |

2. E **Treasury bills having shorter maturity will face less interest rate risk.** [< TOP >](#)
- The coupon paying bonds which pay interest at fixed rate face higher interest rate risk.
- In case of callable bonds, a fall in the interest rate below the coupon rate instigates the issuer to call the bond. This results in reinvestment risk on the part of the investor.
- Zero coupon bonds are free of reinvestment risk but tend to be very sensitive to changes in interest rates.
3. D
$$\frac{F - P}{P} \times \frac{365}{d}$$
Yield is calculated as
Putting the values,
$$\frac{100 - 96.58}{96.58} \times \frac{365}{182} = 0.0710 = 7.10\%.$$
 [< TOP >](#)
4. E It denotes a bond with a coupon rate of 7.8% issued by Government of India with interest payable annually and maturing in 2015. [< TOP >](#)
5. C $1000 = 850 \times (1.09) \times (1+r)$ [< TOP >](#)
or, $r = 7.93\%$
6. D **The maturity of the collateral has no effect on the repo rate.** [< TOP >](#)
All the other statements are true.
- If the collateral is of high quality securities and is highly liquid, a lower repo rate is charged.
 - If the collaterals are delivered to lender, the repo rates would be lower.
 - Repo rates are usually lower than the central bank's fund rates, as they are unsecured borrowing, while repo involves collateralized borrowing.
 - Securities that are in high demand are known as hot collateral or special collateral. Therefore, repo rates would be low when the collaterals to the loan are hot collateral.
7. C In case of a zero coupon bond, maturity = duration [< TOP >](#)
Let w be the weight of the zero-coupon bond with 6 years to maturity. Then we can find w by solving the following equation:
$$W \times 6 + (1 - W) \times 10 = 9$$
$$6W + 10 - 10W = 9$$
$$W = 0.25$$

Therefore, your portfolio would be 0.25 or 25% invested in the zero coupon bond with 6 years to maturity and 0.75 or 75% in zero coupon bond with 10 years to maturity.
8. B A bond's duration is lower when the coupon rate is higher and its duration decreases with decrease in time to maturity. Therefore, bond (b) with the highest coupon rate and lowest term to maturity will have the lowest duration. [< TOP >](#)
9. E
$$\text{Return on debenture} = \frac{\text{Coupon payment} + \text{Appreciation in the price}}{\text{Purchase Price at the beginning of the year}}$$
 [< TOP >](#)
$$\text{i.e. } 0.20 = \frac{\text{Coupon payment} + (2000 - 1800)}{1800}$$

Hence coupon payment = $1800 \times 0.2 - 200 = \text{Rs. } 160.$
$$\text{Coupon rate} = \frac{\text{Coupon payment}}{\text{Face value}} \times 100 = \frac{160}{1500} \times 100 = 10.67\%$$

10. B Monte Carlo simulation model is used to value mortgage –backed and asset-backed securities. [< TOP >](#)
11. D A bond's duration will be equal to its term to maturity if and only if it is a zero coupon bond. When an investor makes no intermediate recoveries, the duration will be equal to term to maturity. [< TOP >](#)
12. B Yield to call = [< TOP >](#)
 $1025 = 48.75 \times \text{PVIFA}(i, 12) + 1100 \times \text{PVIF}(i, 12)$
 $i = 5.21\%$
 Annually = $5.21 \times 2 = 10.42\%$.
13. B Interest rate risk comprises of price risk and reinvestment risk. Bond immunization refers to setting equal the investment time horizon with the duration of the bond. This eliminates the price risk as well as the reinvestment risk. [< TOP >](#)
14. C [< TOP >](#)

$$\text{Premium over conversion value} = \frac{\text{Bond price} - \text{Conversion value}}{\text{Conversion value}}$$
 Where conversion value = Current market price of the stock $\times$ Conversion rate
 Let the conversion rate be x shares.

$$\text{Therefore, Premium over conversion value} = 20\% = \frac{1200 - 50x}{50x}$$
 Solving for x, we get $x = 20 = 20$ shares.
15. E [< TOP >](#)

$$1 + f_4 = \frac{(1 + r_4)^4}{(1 + r_3)^3}$$

$$f_4 = \frac{(1.075)^4}{(1.07)^3} - 1$$

$$f_4 = 9.01\%$$
16. C Treasury Bills are similar to zero coupon bonds and they carry no coupon rate. [< TOP >](#)
17. E All the given statements with respect to Option-Adjusted Spread (OAS) are true. [< TOP >](#)
- It is the spread at which it presumably would be trading over a benchmark, if it had no embedded option.
 - The value of option adjusted spread analysis enables investors to judge the degree to which an instrument's yield compensates them for credit risk, liquidity risk or other such factors.
 - The investor would purchase the bond that has higher option-adjusted spread, as that would offer compensation for the risks taken.
18. D The payment under GPMs starts at a relatively low level and rise for a specified no. of years after which it become equal. [< TOP >](#)
 GPMs are preferred by young first-home buyers whose current income is not sufficient to take on a large loan, but whose income is expected to increase rapidly in the near future.
 GPM is a form of non traditional mortgage.

19. D Unlike normal bonds, which pays coupon semi-annually, mortgage backed securities [< TOP >](#) makes monthly payments. So there is greater possibility of reinvestment risks in the falling interest rate scenario as the investor will have to reinvest the monthly payments at declining interest rates.
- Under the current falling interest rate scenario, call risk will be more because in the declining interest rate scenario, the probability that the issuer will call back the security is high.
- Price risk will be **less** as mortgage-backed or asset backed security, like any other bonds exhibits a **negative** relationship between yield and price of the bond.
20. C When money is cheap or in other words, there is low interest rate-this situation is [< TOP >](#) refer to as 'loose money policy.'
- All the other options refer to inflationary situation, i.e., high interest rate scenario.
21. E More often than not, most of the convertible bonds are callable at the option of the issuer. Some of the convertible bonds are puttable. The put options are further classified into hard puts and soft puts. [< TOP >](#)
- If the convertible bond is redeemable by the issuer only for cash, it is known as hard put.
- If the issuer has the option to redeem the convertible security for cash, common stock, subordinated notes, or for a combination of the three, then it is called a soft put.
22. A Current market price of 10% HCL bond = $100 \text{ PVIFA}(11\%, 3) + 1000 \text{ PVIF}(11\%, 3)$ [< TOP >](#)
= Rs.975.56
- Current market price of 11% RDS bond = $550 \text{ PVIFA}(11\%, 3) + 5000 \text{ PVIF}(11\%, 3)$
= Rs.5000
- Worth of the portfolio = $5000 \times 975.56 + 1000 \times 5000$ = Rs. 0.9877800 crores = 98.778 lakhs
- NAV = Worth of the portfolio/ Number of units = $98.778 / 10$ = Rs.9.8778 = Rs.9.88 (approx)
23. B The coupon rate of Ratchet bond is adjusted periodically at a fixed margin over a reference rate. [< TOP >](#)
- Other statements are not true with respect to Ratchet bond.
- The coupon rate in **dual indexed floaters** is a fixed rate plus the difference between two reference rates.
 - The coupon rate of Ratchet bond can be adjusted **southward only**.
 - The coupon rate of Floaters moves in the same direction as the reference rate.
 - The coupon rate of **De-leveraged floaters** is computed as a fraction of the reference rate plus a quoted margin.
24. D Possible reasons for change in the price of the bond are as follows: [< TOP >](#)
- Changes in the yield requirement of the issuer due to the changes in the quality of credit of the issuer.
 - Change in the price as the bond approaches maturity in case of premium or discount bond.
 - Change in the price because of change in the yields of comparable bonds/securities.
 - As the bond approaches maturity date, the liquidity risk **falls**.

25. E Unlike active strategy, passive strategy believes in Efficient Market Hypothesis. [< TOP >](#)
 Passive strategies do not out perform the market, but perform on par with the market. Such investors take consensus estimates of return and risk and accept the current market price as the best estimate of the security's value. Buy and hold, indexation, immunization, cash flow matching, etc. are different types of passive strategies.
26. B Coupon rate = 10% [< TOP >](#)
 term to maturity = 5 years
 Yield = 11%
 Price of the bond = $100 \times \text{PVIFA}(11, 5) + 1,000 \text{ PVIF}(11, 5)$
 $= 963.05$
 Price of the bond, when yield decreases to 9%, $100 \times \text{PVIFA}(9, 4) + 1,000 \times \text{PVIF}(9, 4) = 1,032.40$
 Capital gain = $1,032.40 - 963.05 = \text{Rs.} 69.35 \times 10 = \text{Rs.} 693.50$
27. D
 - Effective duration is a duration calculation for bonds with embedded options.
 - Effective duration takes into account both the discounting at different interest rates and how the expected cash flows may change.
 - Effective duration can be estimated using modified duration if the bond with embedded options behaves like an option free bond.
 Hence statement (II) is not true.
28. D High-yield issuer would rely **more** on bank loan because its **low** credit rating would make it **less** attractive investment for investors. [< TOP >](#)
 When a high-yield issuer turns to broker loans or reset loan for financing, it is of concern to the bondholders. As the coupon rate of the reset note would be changed periodically, rising interest rates could lead to high borrowing cost.
 A deferred coupon bond, such as zero coupon bond, is a debt instrument that pays no interest until a date specified in the future, a deferred interest payment implies that the future cash flows would be affected by this obligation.
 Hence, statements (II) and (III) s are correct.
29. E To an MBS investor, cash flow comprises three components, [< TOP >](#)

$$CF_t = NI_t + SP_t + PR_t$$
 Where, CF_t = total cash flow to investor.
 SP_t = Scheduled principal payment for each month
 NI_t = monthly interest payment net of servicing and other fees.
 PR_t = forecasted unscheduled principal repayments in each month (prepayments)
30. E If market price is **more** than face value, the **coupon rate will be higher** than the discount rate or the Yield to maturity. As current yield is coupon income/market value, when market value is more than the face value, the current yield will be lower than the coupon rate. Hence, **when MP > FV, coupon rate > Current yield > Yield to maturity.** [< TOP >](#)

Section B : Problems

1. a. Computation of T-bill rate is as shown below: [< TOP >](#)

$$\frac{F - P}{P} \times \frac{365}{d}$$
 Yield is calculated as
 Putting the values,

$$\frac{100 - 93.04}{93.04} \times \frac{365}{364} = 0.0750 = 7.50\%$$

HDFC2012 Bond

Face value = Rs.1000

Coupon rate = 10.25%

Remaining maturity = 4 years

Redemption amount = Rs.1000

Discount rate = 364-day T-bill rate + 2.5% spread = 7.5+2.5 = 10%

Intrinsic value of the above bond

$$102.5PVIFA(10\%, 4) + 1000PVIF(10\%, 4) \\ = 102.5 \times 3.17 + 1000 \times 0.683 \\ = Rs.1007.925$$

PGC2012 Bond

Face value = Rs.1000

Coupon rate = 10.75%

Remaining maturity = 4 years

Redemption amount = Rs.1075

Discount rate = 364-day T-bill rate + 3.5% spread = 7.5+3.5 = 11%

Intrinsic value of the above bond

$$107.5PVIFA(11\%, 4) + 1075PVIF(11\%, 4) \\ = 107.5 \times 3.10 + 1075 \times 0.659 \\ = Rs.1041.68$$

IRFC2012Bond

Face value = Rs.1000

Coupon rate = 11%

Remaining maturity = 4 years

Redemption amount = Rs.1125

Discount rate = 364-day T-bill rate + 4.5% spread = 7.5+4.5 = 12%

Intrinsic value of the above bond

$$110PVIFA(12\%, 4) + 1125PVIF(12\%, 4) \\ = 110 \times 3.04 + 1125 \times 0.636 \\ = Rs.1049.90$$

Since the current market value is less than the intrinsic value in case of Bond PGC2012, Mr. Ankit should opt for this bond.

$$\begin{aligned} \text{b. Current Yield} &= \frac{\text{Coupon Income}}{\text{Market Price}} \times 100 \\ &= \frac{107.5}{1050} \times 100 = 10.24\% \end{aligned}$$

The YTM of the bond is calculated as follows:

@ 12%

$$\begin{aligned} P &= 107.5 PVIFA(12\%, 4) + 1075 PVIF(12\%, 4) \\ &= 107.5 \times 3.0373 + 1075 \times 0.6355 \\ &= Rs. 1009.67. \end{aligned}$$

@ 11 %

$$P = Rs.1041.68 \text{ (as calculated above)}$$

Applying interpolation,

$$YTM = 11 + (12 - 11) \times \frac{(1041.68 - 1025)}{(1041.68 - 1009.67)} = 11.52\% \text{ (approx).}$$

2. Duration of outflows:

Duration can be calculated for the following liability as under:

YTM = 11%

Year	Cash outflow(Rs.)	PVIF @ 11%(Rs.)	
(1)	(2)	(3)	(1)*(3)
1	-----	-----	-----
2	50,000	40,581.12	81,162.24
3	50,000	36,559.57	1,09,678.71
4	50,000	32,936.55	1,31,746.2
5	50,000	29,672.57	1,48,362.85
6	1,70,000 = (50,000 + 1,20,000)	90,888.94	5,45,333.64
		2,30,638.75	10,16,283.64

Therefore, Duration = $10,16,283.64 / 2,30,638.75 = 4.41$ years

Duration of Inflows:

VSF bond:

Firstly, we have to calculate the YTM for the bond

$$101.3 = 9 \text{ PVIFA}(6, i) + 110 \text{ PVIF}(6, i)$$

By trial and error, we get $i = 10\%$

Year	Cash inflow (Rs.)	PVIF @ 10%	Present Value (Rs.)	
(1)	(2)	(3)	(4)	(1)*(4)
1	9	0.909	8.181	8.181
2	9	0.826	7.434	14.868
3	9	0.751	6.759	20.277
4	9	0.683	6.147	24.588
5	9	0.621	5.589	27.945
6	119 = (110 + 9)	0.564	67.116	402.696
			101.226	498.555

Therefore, Duration = $498.555 / 101.226 = 4.93$ years (approx)

SIDBI Deep Discount bond:

Duration for SIDBI Deep Discount bond will be same as its maturity as it is zero coupon bond.

Therefore, duration of SIDBI Deep Discount bond is 4 years.

Now, to immunize the payments, duration of investment = duration of liabilities.

Let proportion of funds to be invested in VSF bond be $x\%$.

Then, the duration of investment = $x \times 4.93 + (1 - x) 4$

As duration of investment = Duration of liabilities

$$4.93x - 4x + 4 = 4.41$$

Therefore, $x = .44$

Proportion of funds to be invested in VSF bond = 44% and SIDBI Deep Discount bond = $(1 - .44) = 56\%$.

3. 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	$\frac{1,000}{(1.11)^3} = 731.19$	$\frac{(1.11)^3}{(1.10)^2} - 1 = 13.03\%$
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b. At the end of one year, the 2 year zero coupon bond will be 1-year zero coupon bond and

$$\frac{1,000}{1.1101}$$

will therefore sell at $1.1101 = \text{Rs.}900.82$.

Similarly, the current 3-year zero coupon bond will be a 2-year zero and will sell at

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

$$= \text{Rs.}796.97.$$

Expected total return

$$\frac{900.82}{826.45} - 1$$

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

$$\frac{796.97}{731.19} - 1$$

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

4. The various risks that are associated with investing in bonds are briefly discussed below:

[< TOP](#)

- i. **Interest rate risk**- there exists an inverse relationship between the bond price and the interest rates. As the bond price fluctuates with the market interest rates, an investor is exposed to a risk because the price of the bond held in his/her portfolio will decline if market interest rate rise. This risk is called interest rate risk.
- ii. **Credit risk**- three primary types of risks make up credit risk. these risks include default, credit spread, and downgrade risk. Default risk considers the borrower's ability to meet obligation in timely manner. Credit spread risk can be defined as the risk wherein an issuer's debt obligation will decline due to an increase in the credit spread. Downgrade risk weighs the effects on the price of the fixed income security when credit rating agencies downgraded it.
- iii. **Liquidity risk**- an investor, who wants to sell a bond even before it reaches its maturity date, would be concerned as to whether he/she will receive a price that is close to the true value of the issue. the risk that the investor will have to sell a bond below its true value is referred to as liquidity risk.
- iv. **Exchange rate or currency risk**- the risk of receiving less domestic currency on bond investment where it makes payments in a currency other than the investor's domestic currency is called exchange rate or currency risk.
- v. **Inflation or purchasing power risk**- inflation or purchasing power risk is the potential risk or loss in the value of cash due to inflation. It arises from the decline in the value of a security's cash flows due to inflation, which is measured in terms of purchasing power.
- vi. **Event risk**- sometimes, the issuer's capability to make interest payment changes all of a sudden. This may be due to certain factors like natural catastrophes, corporate takeover/restructurings, regulatory risk, political risk, etc, wherein the underlying risk involved is termed as event risk.

Apart from the above, bonds with embedded options are prone to following risks:

- vii. **Call risk**- in a bond, there may be a provision that allows the issuer to retire, or call, a or part of the issue before the maturity date. In such cases, the investor faces the inconvenience of getting the bonds called back by the issuer when interest rates fall in the market. This risk of bonds being called in the market before it reaches maturity is referred to as call risk.
 - viii. **Reinvestment risk**- reinvestment risk is the risk involved in reinvesting the proceeds received from the issuer against the callable bonds.
 - ix. **Volatility risk**- volatility risk can be looked upon as the risk that the price of a bond with an embedded option will decrease when expected yield volatility changes.
5. In the context of portfolio asset allocation, fixed income plays an important role for investors of all sizes. Keeping in mind that over long periods of time, fixed income provides much lower returns than equities, but it also provides much lower levels of return volatility. As such, fixed income serves to reduce overall portfolio volatility, especially during times of market stress when equities may fall substantially.

While many investment circles classify Inflation protected securities (IPSs) as fixed income,

these securities are really a separate asset class. This is because their returns correlate poorly with regular fixed income and equities. This fact alone makes IPSs good candidates for helping to create a balanced portfolio; Since IPSs are issued by sovereign governments, there is no (or minimal) credit risk and hence benefit of further diversification.

Inflation protected securities (IPS) offer an additional level of diversification over and above nominal fixed income in that they eliminate the risk of inflation for whatever portion of the portfolio they constitute. Therefore, they will typically exhibit even less risk than nominal bonds, which are subject to inflationary concerns. By combining inflation protected securities with nominal bonds, the fixed-income portfolio should become less volatile, as should the portfolio as a whole.

As is the case with any other investment vehicle, IPS can be used tactically. Just as one may purchase equities at a low price or nominal bonds in anticipation of a decrease in interest rates, IPS can be used to market time according to an investor's expectations regarding inflation.

To summarize, IPS can be a wonderful tool for any investor in maximizing the risk-reward payoff of a portfolio. However, investors should be aware that this newer asset class does come with its own sets of risks. Just as fixed income is an integral aspect of any portfolio, IPS should be considered an integral aspect of the portfolio allocation.

Section C: Applied Theory

6. In a bond, there may be a provision that allows the issuer to retire, or call, all or part of the [< TOP >](#) issue before the maturity date. In such cases, the investor faces the inconvenience of getting the bonds called back by the issuer when interest rates fall in the market. The risk of bonds being called before it reaches maturity is referred to as call risk. The call option gives the issuer an opportunity to pay debts before maturity date. Especially in the falling interest rate periods, the issuer uses this option as he can get funds at a cheaper rate.

With callable bonds, the issuers normally pay a call premium to compensate the investor to some extent. Also, they are normally offered at slightly higher rates compared to normal bonds.

From the investor's perspective, callable bonds have three disadvantages. They are:

- i. An uncertainty exists about the cash flow pattern of a callable bond, because neither the issuers nor the investors know when the bond would be called.
- ii. A fall in the interest rates below the coupon rate instigates the issuer to call the bond. This results in reinvestment risk on the part of the investor because the investor is required to reinvest the proceeds when the bond is called and paid back.
- iii. The price appreciation potential will be lesser in case of a bond with embedded option when compared to an option-free bond. This is called price compression.

Due to the aforesaid disadvantages, a callable bond is said to expose the investor to call risk. When these disadvantages are applicable to mortgage-backed and asset-backed securities where the borrower can prepay principal prior to scheduled principal payment dates then the risk involved is called prepayment risk.

7. The process of Securitization involves the following steps: [< TOP >](#)
- i. Transfer of assets by the originator (person holding the assets) to an entity (company or a trust) specially created for the purpose called Special Purpose Vehicle (SPV). Special Purpose Vehicle is a separate entity formed exclusively for charting this deal and providing funds to the originator; The SPV may be formed as a company under the Companies Act or a trust under the Indian Trusts Act.
 - ii. The assets transferred should preferably be homogenous in nature in terms of the risk attached to them and/or maturity such that the pooling of such assets would be convenient. SPV divides this pool of assets transferred by the originator into marketable securities called Pay or Pass-Through Certificates and resells them to various investors.
 - iii. Investors may either be banks, mutual funds or state or the central government. The investor may even be the parent company or the financier of the originator.'
 - iv. The issue of securities is managed by a merchant banker, who may underwrite the whole issue, or a syndicate of merchant bankers. The originator continues to administer the loan portfolio for some fee and he passes the collections to the trust which services the securities.

Apart from the SPV, a trustee is normally appointed to oversee the process of securitization. An escrow account is created for the purpose of distributing the receivables to the investors in

the deal. The trustee maintains such an escrow account.

[< TOP OF THE DOCUMENT >](#)