COURSE 6
MORNING SESSION

SECTION A – WRITTEN ANSWER

****BEGINNING OF EXAMINATION****
MORNING SESSION

1. *(5 points)*

(a) Describe the passive buy-and-hold investment strategy for fixed-income securities. List the specific types of assets that are included in this strategy.

(b) Describe the types of investors that would use the passive buy-and-hold fixed-income investment strategy.

(c) Outline the advantages and disadvantages of the passive buy-and-hold fixed-income investment strategy.

2. *(6 points)*

(a) List the major financial instruments available in the money market. Outline their features.

(b) Describe the features of preferred stocks that are similar to those of:
- Equity investments
- Debt instruments

3. *(7 points)* You are given the following information for a bond portfolio:

Bond	Term (Years)	Annual Coupon Rate (Paid Semi-Annually)	Price	Nominal Value
A	10	0.0%	122	200
B	3	4.8%	100	100
C	5	floating equal to one-year Treasury bill rate plus 50 bps reset annually	100	100

The floating bond rate has just been reset based on the one-year Treasury bill rate of 4% (bond equivalent yield).

(a) *(2 points)* Differentiate between effective and modified duration. Describe the limitations of using duration as an interest rate risk measure.

(b) *(4 points)* Calculate the effective duration of the portfolio.

(c) *(1 point)* Using effective duration, estimate the price of the portfolio given a 50 basis point parallel upward shift in the yield curve.

Show all work.

4. *(6 points)* You are given the following:

- The expected return for Stock Fund A is 20% per annum
- The expected return for Bond Fund B is 12% per annum
- The risk-free rate is 4% per annum

The mean variance frontier takes the following analytical form:

$$\frac{x^2}{180} - \left(\frac{3y-28}{16}\right)^2 = 1$$

where x is the standard deviation σ_p of the portfolio and y is the mean return $E\left(r_p\right)$ of the portfolio.

The tangent drawn from the point (0,4) touches the mean variance frontier at (18.974, 14.667).

(a) Graphically illustrate a general Markowitz optimal portfolio selection method.

(b) Determine the asset mix, expected return and standard deviation of the global minimum-variance portfolio.

(c) Calculate the reward-to-variability ratio.

Show all work.

5. *(6 points)*

(a) Compare currency futures, currency forwards and currency swaps. Explain how each can be used to hedge currency risk.

(b) You are entering into a two-year swap paying 9.0% fixed in Euros for the 6-month LIBOR in US dollars. The notional amounts are 100 million Euros and 150 million USD, respectively.

The LIBOR is 10% for the first year and 11% for the second year. The exchange rate remains at 1 Euro = 1.5 USD for more than a year and a half and then changes before the last payment is made.

Determine the exchange rate such that the swap contract results in a zero net payment.

Show all work.

6. *(4 points)* You are given the following with respect to two portfolios:

	Portfolio A	Portfolio B
Correlation coefficient between the portfolio return and market return	0.9	0.8
Firm specific variance	0.2	0.3
Expected return	12%	13%

The market variance is 0.64 and the risk-free rate is 6%.

Determine if an arbitrage opportunity exists and explain how to exploit it.

Show all work.

7. *(6 points)*

(a) List and describe the types of mutual funds available.

(b) Describe the following investment funds:
- Commingled funds
- Real estate investment trusts
- Hedge funds

Compare each of the above investment funds to mutual funds.

USE THIS PAGE FOR YOUR SCRATCH WORK

COURSE 6
MORNING SESSION

SECTION B – MULTIPLE CHOICE

1. Questions 1 through 5 consist of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

(A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.

(B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.

(C) If the assertion is a true statement, but the reason is a false statement.

(D) If the assertion is a false statement, but the reason is a true statement.

(E) If both the assertion and the reason are false statements.

	ASSERTION		REASON
1.	In a secondary market, if neither the floater's risk nor the compensation demanded by the market change, the floater's price will be equal to par on every coupon reset date.	BECAUSE	When a floater is issued, the quoted margin contained in the coupon formula will be set so that the floater is priced at or near par.

	ASSERTION		REASON
2.	For a new public offering of a security in the U.S., the preliminary prospectus is known as a red herring.	BECAUSE	In the preliminary prospectus, a statement is printed in red stating that the company is not attempting to sell the security before the registration is approved.

	ASSERTION		REASON
3.	Web-based initial public offerings (IPOs) have captured a large share of the underwriting market.	BECAUSE	Web-based IPOs have a low cost.

	ASSERTION		REASON
4.	A line of credit is not a reliable source of cash during a liquidity crisis.	BECAUSE	A line of credit can be an expensive source of cash.

	ASSERTION		REASON
5.	Short sales are often accompanied by limit-buy orders.	BECAUSE	Limit-buy orders cap the potential losses from short sales.

6. You are given the following:

- Strip bond at 1000 par value
- Cash flows are payable at the end of the year
- Annual rates of return

Year	Current Price of Strip Bond	Spot Rate	Forward Rate	Cash Flow
1	900			0
2		9.0%		0
3			6.5%	100
4				100
5	720		5.0%	0

Calculate the present value of the cash flows.

(A) 148

(B) 153

(C) 155

(D) 158

(E) 163

USE THIS PAGE FOR YOUR SCRATCH WORK

7. You are given the following with respect to a security:

- Market value: 1000
- Cash flow at end of year 1: 500
- Cash flow at end of year 2: 700

Calculate the modified duration.

(A) 1.33

(B) 1.38

(C) 1.52

(D) 1.55

(E) 1.75

USE THIS PAGE FOR YOUR SCRATCH WORK

8. You are given the following with respect to a security:

Shift in Yield Curve (basis points)	Price
–50	4,000
–25	3,600
0	3,400
+25	3,250
+50	3,100

- Accrued interest: 900
- Maturity value: 10,000

Calculate the effective duration using an OAS model for a total yield curve shift of 50 basis points.

(A) 5.5

(B) 16.3

(C) 20.6

(D) 41.9

(E) 52.9

USE THIS PAGE FOR YOUR SCRATCH WORK

9. You are given the following with respect to a stock:

- The European call option expires in six months with strike price of 26
- The market value is 25
- The variance is 2.25%

The risk-free rate is 10% compounded continuously. You are given the following from the Cumulative Normal Distribution.

Z	N(Z)	Z	N(Z)
0.01	0.50399	0.11	0.54380
0.02	0.50798	0.12	0.54776
0.03	0.51197	0.13	0.55172
0.04	0.51595	0.14	0.55567
0.05	0.51994	0.15	0.55962
0.06	0.52392	0.16	0.56356
0.07	0.52790	0.17	0.56749
0.08	0.53188	0.18	0.57142
0.09	0.53586	0.19	0.57535
0.10	0.53983	0.20	0.57926

Calculate the value of the call option.

(A) 0.30

(B) 0.41

(C) 0.92

(D) 1.18

(E) 2.20

USE THIS PAGE FOR YOUR SCRATCH WORK

10. A firm is short a LIBOR participating cap at a strike rate of 8% with a participation rate of 80%. LIBOR rises to 10%.

Determine the firm's payment to the counterparty.

(A) 0% of LIBOR

(B) 4% of LIBOR

(C) 16% of LIBOR

(D) 20% of LIBOR

(E) 25% of LIBOR

USE THIS PAGE FOR YOUR SCRATCH WORK

11. You are given the following with respect to a stock:

- The one-year call option has a strike price of 25
- The value of the put option is 5
- The continuously compounded risk-free rate of return is 10%

Using put-call parity, calculate the difference between the price of the stock and price of the one-year call option.

(A) 17.62

(B) 20.00

(C) 22.63

(D) 27.62

(E) 32.63

USE THIS PAGE FOR YOUR SCRATCH WORK

12. Questions 12 through 18 consist of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	Lettered Item	Is Related to Numbered Items
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only

(E) The correct answer is not given by (A), (B), (C) or (D).

12.

X.	Projected unit credit method	I.	Takes gains and losses and rolls them into future normal costs
Y.	Aggregate funding method	II.	Is used to calculate the accounting pension expense under FAS 87
		III.	Produces a relatively stable stream of future funding costs for a mature plan

13.

X.	Tactical strategies	I.	Involve interest rate expectations strategies
Y.	Strategic strategies	II.	Include rich/cheap analysis strategies
		III.	Involve inter-sector and intra-sector allocation strategies

14.

X.	Broad-based bond market indexes	I.	Lehman Brothers U.S. Aggregate Index
Y.	Equity market indexes	II.	Merrill Lynch Domestic Market Index
		III.	Dow Jones Industrial Average

15.

X.	Capital asset pricing model	I.	Requires knowledge of the market portfolio
Y.	Arbitrage pricing theory	II.	Recognizes multiple unsystematic risks
		III.	Investors are mean variance optimizers

16.

X.	Accumulated cash flow techniques	I.	Usually model liability renewals
Y.	Discounted cash flow techniques	II.	Best for buy-and-hold investment strategies
		III.	Shocked curve used to quantify interest rate exposure

17. Questions 12 through 18 consist of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	Lettered Item	Is Related to Numbered Items
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only

(E) The correct answer is not given by (A), (B), (C) or (D).

17.

X.	Short rates projected according to a Markovian process	I.	Expected rate change is zero
Y.	Short rates projected according to a Martingale process	II.	Next rate change is independent of previous rate changes
		III.	Is implied by a recombining lattice

18.

X.	Stratified sampling	I.	Samples deterministic and uniformly distributed points
Y.	Low-discrepancy methods	II.	Samples the region for random variates by looking at a finite set of disjoint subregions
		III.	Takes more observations where it is considered to be more important to do so

USE THIS PAGE FOR YOUR SCRATCH WORK

19. Questions 19 through 23 consist of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

(A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.

(B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.

(C) If the assertion is a true statement, but the reason is a false statement.

(D) If the assertion is a false statement, but the reason is a true statement.

(E) If both the assertion and the reason are false statements.

	ASSERTION		REASON
19.	There is a large degree of homogeneity in stress testing scenarios among financial institutions.	BECAUSE	Stress testing is a standard risk management technique employed by financial institutions.

	ASSERTION		REASON
20.	Diversifying a bond portfolio by adding higher quality securities can decrease the RBC ratio.	BECAUSE	Diversification can reduce the number of bonds going through the concentration factor calculation for RBC.

	ASSERTION		REASON
21.	Agency securities have very high credit quality.	BECAUSE	Agency securities are typically backed by the full faith and credit of the U.S. government.

	ASSERTION		REASON
22.	Allocating Employee Retirement Income Security Act (ERISA) trust assets to investments that provide a more consistent level of contributions may be a prudent and legitimate decision.	BECAUSE	According to the duty of loyalty, the trustee is required to administer the trust in the interests of the plan sponsor.

	ASSERTION		REASON
23.	The issuer of an extendible reset bond can reset the coupon rate so that the bond will trade at a pre-determined price.	BECAUSE	The coupon rate on an extendible reset bond resets based on a fixed spread to some benchmark.

24. You are given the following with respect to a stock:

- Expected return: 10%
- Beta: 0.75
- Firm specific standard deviation: 25%

The market index has a standard deviation of 20%. The risk-free rate is 5%.

Calculate the standard deviation of the stock.

(A) 6.32%

(B) 8.50%

(C) 27.41%

(D) 29.15%

(E) 30.41%

USE THIS PAGE FOR YOUR SCRATCH WORK

25. You are given the following with respect to bids received by a company offering 100,000 shares through a Dutch auction.

Bid	Number of Shares	Bid Price
1	35,000	9.00
2	10,000	7.00
3	50,000	7.50
4	25,000	12.00

Calculate the amount raised by the company.

(A) 700,000

(B) 750,000

(C) 883,333

(D) 915,000

(E) 1,200,000

USE THIS PAGE FOR YOUR SCRATCH WORK

26. You are given the following with respect to a contingent immunization strategy:

- Investment time horizon: 6 years
- Safety net rate: 5.0%
- Initial portfolio value: 100 million
- Duration of the invested asset: 12 years
- Current yield: 6.5%

Assuming semi-annual compounding, calculate the trigger point.

(A) 7.25%

(B) 7.50%

(C) 7.75%

(D) 8.00%

(E) 8.25%

USE THIS PAGE FOR YOUR SCRATCH WORK

27. You are given the following with respect to a one-period securities market model:

$$S(0) = \begin{bmatrix} 0.8 & 6 & 1 \end{bmatrix}$$

$$S(1) = \begin{bmatrix} 1 & 14 & 0 \\ 1 & 6 & 0 \\ 1 & 7 & 5 \end{bmatrix}$$

Calculate the product of the elements of the state price vector P.

(A) 0.0100

(B) 0.0119

(C) 0.0135

(D) 0.0144

(E) 0.0160

USE THIS PAGE FOR YOUR SCRATCH WORK

28. You are given the following with respect to a zero-coupon bond portfolio:

Term (Years)	Spot Rate	Maturity Value
5	4.20%	2,500,000
10	4.80%	1,000,000
15	5.50%	5,000,000
20	6.00%	3,000,000

Calculate the yield to maturity of the portfolio.

(A) 5.1%

(B) 5.2%

(C) 5.3%

(D) 5.4%

(E) 5.5%

USE THIS PAGE FOR YOUR SCRATCH WORK

29. You are given the following parameters:

$r(0)$	$v(0)$	μ	ξ	α	κ	γ	Δt	ρ
0.06	0.0005	0.055	0.003	0.0002	0.5	0.75	1	0.5

You are given the following from a standard normal distribution:

Observation	Value
1	–1.0568
2	0.2015
3	–0.8458
4	0.5491
5	1.3476
6	–0.7599

Using a discrete Fong-Vasicek model, project the time two interest rate.

(A) 2.80%

(B) 3.10%

(C) 3.40%

(D) 5.20%

(E) 5.60%

USE THIS PAGE FOR YOUR SCRATCH WORK

30. Questions 30 through 34 consist of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	Lettered Item	Is Related to Numbered Items
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only

(E) The correct answer is not given by (A), (B), (C) or (D).

30.

X. IRS approval is automatic

Y. IRS approval requires filing

I. A change in the valuation date due to a plan merger

II. A change in the asset valuation method from market value to average market value without a phase-in period

III. A change in the funding method three years after an asset valuation method change

31.

X.	Pure expectations theory	I.	The shape of the yield curve is determined by supply and demand for securities within each maturity sector
Y.	Market-segmentation theory	II.	Investors expect the return for any investment horizon to be the same, regardless of the maturity strategy selected
		III.	Investors have preferred habitats dictated by the nature of their liabilities

32.

X.	Best-efforts agreement	I.	Investment bankers may receive other securities of the firm
Y.	Firm commitment	II.	Less common approach for initial public offerings
		III.	Investment bankers bear the risk of being unable to sell securities at the agreed price

33. Questions 30 through 34 consist of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	Lettered Item	Is Related to Numbered Items
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only
(E)	The correct answer is not given by (A), (B), (C) or (D).	

33.

X.	Benefit approach investment management style for defined contribution plans	I.	Less concern as to cost or long term return of the funds
Y.	Financial approach investment management style for defined contribution plans	II.	Emphasis on investment theory
		III.	Concern with flexibility and variety of the plan

34.

X.	Redirect principal only	I.	PACs
Y.	Redirect principal and interest	II.	Z bonds
		III.	Floaters and inverse floaters

USE THIS PAGE FOR YOUR SCRATCH WORK

35. Questions 35 through 40 consist of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

(A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.

(B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.

(C) If the assertion is a true statement, but the reason is a false statement.

(D) If the assertion is a false statement, but the reason is a true statement.

(E) If both the assertion and the reason are false statements.

	ASSERTION		REASON
35.	Investors expect to be compensated for loss of liquidity.	BECAUSE	Liquidity is the ability to dispose of an asset quickly at a small spread between the bid and ask prices.

	ASSERTION		REASON
36.	There are problems in directly applying the equity option pricing model to price fixed-income securities.	BECAUSE	The volatility of the fixed-income security tends to increase with time.

	ASSERTION		REASON
37.	In the multi-period securities market model, the time k history $H(k)$ will be a subset of the time $k+1$ history $H(k+1)$.	BECAUSE	If $\omega \varepsilon H(k+1)$ is alive at time $k+1$, then it must have been alive at time *k*.

	ASSERTION		REASON
38.	The yield on a convertible bond is typically lower than the yield of the underlying common stock.	BECAUSE	The cumulative yield difference between the bond and the common stock represents the payment for the conversion privilege.

	ASSERTION		REASON
39.	The minimum value of a convertible bond is equal to the greater of its straight value and its conversion value.	BECAUSE	If the convertible bond is traded at less than either its straight value or its conversion value, an arbitrage opportunity occurs.

	ASSERTION		REASON
40.	Delta hedging of barrier options requires a large amount of trading as the underlying asset approaches the barrier.	BECAUSE	The gamma is high as the option is close to the money.

****END OF EXAMINATION****
MORNING SESSION

COURSE 6
AFTERNOON SESSION

WRITTEN ANSWER

****BEGINNING OF EXAMINATION****
AFTERNOON SESSION

8. *(5 points)*

(a) *(4 points)* Describe the types of secured and unsecured corporate bonds.

(b) *(1 point)* You are given a corporate bond portfolio for which no bonds will mature, be added or be sold in the next year. Formulate how a one-year forecast of the portfolio par value could be developed based on the historical experience of the portfolio.

9. *(6 points)* You are given the following with respect to a parent company and its one subsidiary. Both companies are subject to Risk-Based Capital (RBC) requirements.

	Parent Company		Subsidiary	
Risk Category	Average Factor	Amount (millions)	Average Factor	Amount (millions)
C1	2.50%	3,000	4.00%	1,500
C2	0.70	80	0.85	35
C3	0.60%	2,300	0.75%	950
C4	1.50%	300	2.00%	140

(a) Define each RBC risk category.

(b) Calculate the RBC and the effect of the covariance adjustment for the total company.

(c) List and describe different ways a company can enhance its RBC position.

Show all work.

10. *(8 points)* You are given the following for a single factor multiplicative binomial model:

- Current short rate: 8%
- Constant volatility parameter: 25%
- Probability of an upward movement: 60%
- Time step: 1 year

(a) Calculate the three-year spot rate.

(b) A three-year interest rate floor has the following characteristics:

- Strike level: 7%
- Notional amount: 1000
- Payments: annual based on current short rate at the time of the payment

Calculate the price of the three-year interest rate floor.

(c) Using a three-year strip and a loan at the current short rate to replicate a one-year interest rate floor at 7%, determine if an arbitrage opportunity exists.

Show all work.

11. *(4 points)* You are given the following with respect to the liabilities for two pension plans:

	Plan A	Plan B
Liability/Asset Ratio	80%	85%
Liability Return	2%	6%

You are given the following with respect to the assets backing the two plans:

	Average Return	Plan A Asset Mix	Plan B Asset Mix
Government Bonds	5.0%	50%	20%
Corporate Bonds	7.5%	30%	30%
Equities	10.0%	20%	50%

(a) Using the current asset mix, calculate the expected surplus return for each plan.

(b) You are given the following with respect to alternate asset mixes for the two pension plans:

Asset Mix	Expected Surplus Return	Standard Deviation	Risk Tolerance
Plan A Option 1	8.75%	3%	1.5
Plan A Option 2	6.00%	1%	1.5
Plan B Option 1	8.00%	2%	6.0
Plan B Option 2	12.00%	5%	6.0

Assuming a standard utility function, recommend the best asset mix for each plan under a surplus optimization approach.

Show all work.

12. *(8 points)*

(a) Describe the low risk factors associated with rebalancing and liquidity management practices.

(b) Describe the requirements and considerations for constructing and maintaining an immunized portfolio.

(c) You are given the following asset and liability cash flow streams:

Time	1	2	3	4	5
Asset 1	100	100	100	100	100
Asset 2	150	0	100	50	200
Asset 3	50	150	100	125	75
Liability	80	90	150	80	100

(i) Assuming end of year cash flows and a yield to maturity of 6%, calculate M^2 for each asset.

(ii) Based on Redington's immunization strategy, select one of the above assets to back the liability.

Show all work.

13. *(5 points)*

(a) Describe delta, gamma and theta as they apply to derivatives.

(b) You are given the following for a one-year European call option that can be valued using a binomial model:

- Number of time intervals: 25
- Value of call option: 0.1

Node (i, j)	(1, 0)	(1, 1)	(2, 0)	(2, 1)	(2, 2)
$S(i, j)$	1.25	1.50	1.40	1.65	1.60
$V(i, j)$	0.25	0.30	0.15	0.20	0.10

Calculate delta, gamma and theta at node (0, 0).

Show all work.

14. *(4 points)*

(a) Describe the value-at-risk (VaR) model.

(b) Describe the purpose of conducting stress tests in risk management. Explain why stress tests are a complement to the VaR model as a risk management tool.

(c) List the common stress test themes that concern financial institutions and provide an example of a stress test scenario for each theme.

****END OF EXAMINATION****
AFTERNOON SESSION