INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

27 April 2022 (am)

Subject SP5 – Investment and Finance
Specialist Principles

Time allowed: Three hours and twenty minutes

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator.

If you encounter any issues during the examination please contact the Assessment Team on T. 0044 (0) 1865 268 873.

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1 An investor, with no other assets, has recently inherited a large cash sum and now wishes to invest this money so as to maximise their after tax returns.

The investor is subject to the following taxes:

	Equities	*Bonds*	*Property*
Tax on income	30%	20%	30%
Tax on realised capital gains	30%	30%	30%
Tax-free income allowance	$5,000	$1,000	Nil
Tax-free capital gains allowance	$10,000	$10,000	$200,000
Gains indexed?	Yes	No	Yes

(i) Discuss how this tax regime may affect the investor's decisions on which of these investments they should purchase. [7]

(ii) Outline the actions the investor could take to reduce or minimise their tax liability on an investment portfolio containing equities, bonds and property. [3]

[Total 10]

2 A pension scheme's trustees decide to conduct a review of the pension scheme's investment strategy by carrying out an Asset Liability Modelling (ALM) process.

The pension scheme has a roughly equal mix of deferred pensions and pensions in payment and the pension scheme's liabilities are partly linked to inflation.

(i) Describe how the shape of the liability cash flows will change over time for this pension scheme. [2]

(ii) State the additional information that an ALM process could provide for this pension scheme compared to a traditional actuarial valuation. [3]

The current asset mix of the pension scheme, which is based in Country X, is shown below.

Asset class	*Management style*	*Percentage of total assets*
Equities listed in Country X	Passive	70
Fixed interest government bonds issued in Country X	Passive	20
Corporate bonds issued in Country X	Active	10
Total		**100**

The trustees conclude that the level of investment risk for the pension scheme is too high.

(iii) State the investment risks the scheme could face. [2]

(iv) Suggest, with reasons, changes the trustees could make to the investment strategy to reduce the level of investment risk. [4]

(v) Discuss the possible disadvantages of these changes. [6]

[Total 17]

3 (i) Explain why a Portfolio Manager would move from holding a passive index-tracking equity portfolio to an equivalent portfolio holding a basket of index equity futures. [4]

(ii) Describe the main disadvantages that would need to be considered prior to implementing the change. [3]

(iii) Explain why the Portfolio Manager may have a preference to implement this trade using exchange-traded derivatives. [7]

[Total 14]

4 The value of a futures contract, F, of a commodity can be determined according to the following formula:

F = spot price of commodity + cost of carry – convenience yield

(i) State whether the futures prices of copper would be expected to increase or decrease relative to the spot price in the case of the events outlined below.

(a) The cost of insuring stored copper increases

(b) Restrictions on copper imports in major industrial countries are expected to be introduced

(c) Lack of storage capacity in the copper market

(d) A reduction in interest rates.

[2]

(ii) Explain why the futures prices in part (i) increased or decreased. [4]

The Manager of an Exchange Traded Fund (ETF) tracking a major equity index observes that the market price of the ETF is 2% below its net asset value. The Manager wants to reduce this difference.

(iii) Outline the steps the Manager could take to bring the price of the ETF back into line with its net asset value. [4]

(iv) Identify the practical considerations that the Manager needs to take into account as it performs these steps. [2]

[Total 12]

5 An infrastructure investment fund is considering investing in a project to construct a tunnel under a major river. This tunnel would mean that motorists travelling between two large cities could reduce their journey time by an hour. Motorists would pay a toll to use the tunnel.

(i) List the issues the fund should consider before making the investment. [4]

As part of the decision process, the investment fund is looking at other infrastructure projects. One of these projects is a toll bridge over a river in another country connecting two large cities. As for the tunnel, using the bridge would save motorists an hour. The two cities for the tunnel and the bridge projects are roughly the same size.

(ii) Evaluate the fund's choice of the bridge project as a comparator. [3]

The projections for the tunnel are as follows.

Construction costs:

Year	*Costs ($m)*
1	50
2	100
3	150
4	150
5	75
6	10

From year 7 onwards $1m p.a. will need to be spent on maintenance and after 15 years a further single payment of $10m will need to be spent.

Traffic projections:

Traffic figures per year		
Year	*Cars*	*Other vehicles*
5	500,000	300,000
6	5,000,000	3,000,000
7	6,000,000	4,200,000

Cars will be charged $5 and other vehicles $8 to use the tunnel.

After 25 years the tunnel's ownership passes to the regional government.

(iii) Derive, using the figures above, the expression you would use to calculate the rate of return on the project. [5]

[Total 12]

6 The Directors of a company have proposed a new remuneration system for the Directors, which will contain four elements. These are as follows:

- The contracts will be on a 5-year rolling basis.
- A basic salary will be paid that will increase annually in line with the basic salaries of the Directors of their four main competitors.
- Share options in the company will be granted each year amounting to 30% of their basic salary. The share options will be exercisable after 3 years, with the exercise price 10% below the share price at the time of grant.
- A bonus will be paid that will be calculated with reference to the earnings per share growth of the company over the previous year. If the earnings per share had fallen over the previous year, then no bonus would be paid.

(i) Discuss whether this system of remuneration would act in the best interests of the other stakeholders of the company. [6]

(ii) Suggest possible amendments to the scheme that would be beneficial to the other stakeholders while incentivising the Directors. [6]

[Total 12]

7 An investor holds 100 shares in XYZ Ltd. They sell a call option on XYZ for 3.40 and they also sell a put option for 3.05. Both options have a strike price of 100 and the same expiry date.

(i) Calculate the overall profit or loss if the price of XYZ at the expiry date of the options was:

(a) 90.

(b) 100.

(c) 110.

[3]

You may ignore taxes and transaction costs.

(ii) Calculate the share price that XYZ needs to achieve for the trade to break even. [3]

(iii) Comment on the investor's strategy. [2]

[Total 8]

8 A large institution decided to increase its investment in real estate over a 2-year period, selling equal amounts of bonds, equities and infrastructure to fund the investment in real estate.

(i) Suggest possible reasons why the institution decided on a 2-year period. [2]

The starting positions and the target positions for the fund's benchmark are given in the table below:

Asset	*Old benchmark (%)*	*New benchmark (%)*
Bonds	50	46
Equities	35	31
Infrastructure	14	10
Real estate	0	12
Cash	1	1
	100	100

All the assets were managed by a global investment company and at the start of the period the institution said it would adjust the performance benchmark in equal amounts every year to reflect the move into real estate. So, for example, after 1 year, the benchmark weight for real estate would be 6% and that for the bonds would be 48%. Benchmark changes take place at the end of the year.

The performance of the benchmark indices for the asset classes over the 2-year period is given below:

Asset	*Index at start*	*Index after 1 year*	*Index after 2 years*
Bonds	240	245	255
Equities	350	320	390
Infrastructure	210	185	200
Real estate	230	270	300
Cash	120	121	122

(ii) Calculate the benchmark performance for the fund for each of the years. [4]

(iii) Calculate the benchmark performance for the fund for the 2-year period. [1]

The actual value of the fund's assets is given below:

Asset	*Value at start*	*Value after 1 year*	*Value after 2 years*
Bonds	800	810	820
Equities	500	450	500
Infrastructure	185	155	175
Real estate	0	95	200
Cash	15	10	5
Total	**1500**	**1520**	**1700**

(iv) Calculate the relative performance of the fund for each year. [2]

(v) Calculate the fund's relative performance over the 2-year period. [1]

(vi) Suggest what further information you would need to evaluate the performance of the Portfolio Managers. [5]

[Total 15]

END OF PAPER