Institute of Actuaries of India

CT7 – Economics

Indicative Solution

November 2008

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable

1. B
2. C
3. A
4. A
5. C
6. D
7. D
8. C
9. A
10. B
11. D
12. A
13. B
14. D
15. D
16. C
17. A
18. B
19. C
20. A
21. C
22. marks awarded to any answer
23. B
24. B
25. B
26. A
27. D

28. a) *1. Comparability*
An investor can state a preference between all available certain outcomes. In other words, for any two certain outcomes A and B, either:
A is preferred to B,
B is preferred to A,
or the investor is indifferent between A and B.

2. Transitivity
If A is preferred to B and B is preferred to C, then A is preferred to C. *ie* A > B and B > C means A > C
Also: A = B and B = C □ A = C
This implies that investors are consistent in their rankings of outcomes.

3. Independence
If an investor is indifferent between two certain outcomes, A and B, then he is also indifferent between the following two gambles (or lotteries):
(i) A with probability p and C with probability $(1 - p)$; and
(ii) B with probability p and C with probability $(1 - p)$.

Hence, if $U(\mathrm{A}) = U(\mathrm{B})$ then:
$p\, U(\mathrm{A}) + (1–p)\, U(\mathrm{C}) = p\, U(\mathrm{B}) + (1–p)\, U(\mathrm{C})$.
Thus, the choice between any two certain outcomes is independent of all other certain outcomes.

4. Certainty equivalence
Suppose that A is preferred to B and B is preferred to C. Then there is a unique probability, p, such that the investor is indifferent between B and a gamble giving A with probability p and C with probability $(1 - p)$.
Thus if:
$U(\mathrm{A}) > U(\mathrm{B}) > U(\mathrm{C})$
Then there exists a unique p (0 1 p < <) such that:
$p\, U(\mathrm{A}) + (1–p)\, U(\mathrm{C}) = U(\mathrm{B})$.
B is known as the *certainty equivalent* of the above gamble.

b) Note that the expected value of a_1 is \$1 million and the expected value of a_2 is \$1.39 million. By preferring a_1 to a_2, an agent is presumably maximizing EU, not expected value. If $a_1 > a_2$, then $u(1) > 0.1u(5) + 0.89u(1) + 0.01u(0)$, implying that $0.11u(1) > 0.1u(5) + 0.1u(0)$, which in turn [adding $0.89u(0)$ to each side] implies $0.11u(1) + 0.89u(0) > 0.1u(5) + 0.90u(0)$. This suggests that an EU-maximizing agent must prefer a_4 to a_3. . However, his choice in the first stage is inconsistent with his choice in the second stage, and thus the paradox emerges where the independence axiom gets violated.

c) Stochastic dominance, mean variance rule, behavioral finance

[10]

29.

a. $P_f(x) = \int 3x^2 = x^3 \quad \textit{for } 0 \le x \le 1$

$_g(x) = \int (2x^3 + x) = \frac{1}{2}x^4 + \frac{1}{2}x^2 \quad \textit{for } 0 \le x \le$

b. $\frac{1}{2}x^4 + \frac{1}{2}x^2 \ge x^3 \quad \textit{for } 0 \le x \le 1$

Thus, security f exhibits first order stochastic dominance over security g.

c. $$\int\left[\frac{1}{2}x^4 + \frac{1}{2}x^2\right] \ge \int x^3$$

$$= \left[\frac{1}{10}x^5 + \frac{1}{6}x^3\right] \ge \frac{1}{4}x^4 \quad \textit{for } 0 \le x \le 1$$

Thus, security f exhibits second order stochastic dominance over security g.

[6]

30. a [**High, High**]is the dominant strategy in the above pay off matrix

Neither of the bidders gets the best payoff possible. [+75, +75] is the likely payoff and only one of the bidders would receive such a payoff contingent on who wins the bid by a marginally higher price. The seller too does not get the maximum possible money.

This is not the most efficient form of auction from either perspective as this does not lead to honest bidding. i.e. bidders generally lower their bids to avoid paying out extra as compared to "true value" of the object (license). A second price auction gets over this problem where the best strategy for the bidders is to bid the "true value" without a fear of big loss if the bid turns out to be exceptionally higher.

a. There can be several ways the players can collude in this situation. They can manipulate the process by bidding arrangements that are separate for different circles. The collusion that maximizes the payoff for the bidders would be for Bidder 1 to bid high and bidder 2 low for two of the circles; and for the other two circles Bidder 1 can bid low and bidder 2 high so that both of them win 2 circles each and maximize their payoff.

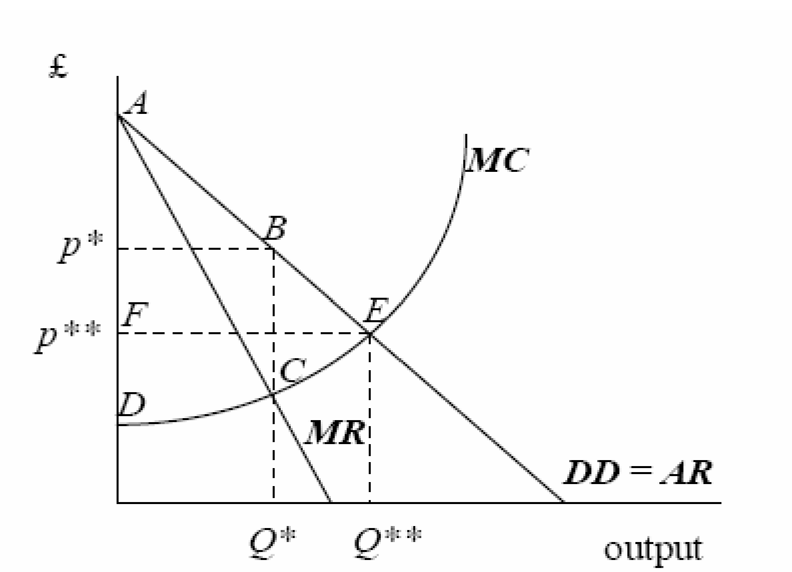
	Bidder 1	**Bidder2**
2 circles	Low	High
2 circles	High	Low
Payoff	**+75**	**+75**

The payoffs for both of them are now certain at +75 each.

As a result of this collusion, government also ends up losing revenue because bidders would be inclined to bid only marginally higher than the low bid (which is assumed to be known in this case as a result of collusion)

[8]

31.



A monopolist firm having to charge the same price for all consumers would end up producing at a level where MC=MR and hence at p* Q* level making a consumer surplus of Ap*B. Producers' surplus – the excess of revenue over total variable costs – is represented by the area bounded by p*BQ* and the marginal cost curve.

A monopolist firm which can perfectly price discriminate would have produce a t a level where MC=AR .i.e. at Q**. At such a level, the monopolist gets all the consumer surplus Ap*B by charging extra price for each of the goods corresponding to quantity Q* and the producer surplus would now be defined by area bounded by p*BEQ** and the marginal cost curve.

[5]

32. NNP at basic prices = GDP at market prices [0.5]
– Indirect taxes (net of subsidies) [0.5]
+ net property income from abroad [0.5]
– depreciation [0.5]

[2.5]

33.

- Trade union power to resist wage cuts
- Minimum wage legislation
- Wage contracts
- Insider outsider distinctions
- Efficiency wages
- State benefits for being unemployed
- Tax on earned income
- Costs of finding a job
- Costs of retraining

[3]

34. Labour

- education and training about using modern techniques in agriculture
- training on using modern technology
- Improving health of the people so they can work more productively.

Land

- by using fertilizers
- by using modern technology to produce more in the same land
- improving production by using advanced agriculture methods

[3]

35. Money supply

i. open market operations
   - Selling bills and gilts will result in the banks cash balances being reduced.

ii. Reserve requirements
   - The commercial banks can be required to keep a certain minimum level of cash reserves to deposits.
   - An increase in reserve requirements restricts the banks ability to expand the money supply through lending.

- This will only be effective if the reserve requirement is at a higher level than the banks would themselves have chosen on grounds of prudence.

iii. The discount rate
- The discount rate is the rate of interest which the central bank charges to the commercial banks in its role as a lender of last resort.
- Higher the official discount rate, the less the banks will risk having to borrow from central bank. Thus they will maintain higher cash reserves.

iv. Avoid Printing money
- Reducing printing money will help reducing money supply.

v. Credit Control
- Discouraging mortgage lending
- Minimum deposits in all consumer credit transactions
- Restrict terms on which lending could take place

[7]

36. International trade

vi. goods produced by each country

	Electric Bulbs	Head Phones
Country A	800	500
Country B	500	250

Each country has 4000 hours of labour and uses 2000 hours each for both the goods. So, no of hours spent per unit on each good

	Electric Bulbs	Head Phones
Country A	2.5	4
Country B	4	8

Since country A produces both goods in less time,
Country A has absolute advantage in producing Electric Bulbs
Country A has absolute advantage in producing Head Phones

vii. for Country A,
Opportunity cost of producing Electric Bulbs = 2.5/4 = 0.625
Opportunity cost of producing Head Phones = 4/2.5 = 1.6

For Country B,
Opportunity cost of producing Electric Bulbs = 4/8 = 0.5
Opportunity cost of producing Head Phones = 8/4 = 2

For Electric Bulbs, since country B has lower opportunity cost, Country B has comparative advantage.
For Head Phones, since country A has lower opportunity cost, Country A has comparative advantage.

viii. As Country A has decided to double the labour, Country B has decided to reduce the number of working hours of labour, following will now be the productivity of both countries.

	Electric Bulbs	Head Phones
Country A	1600	1000
Country B	500	250
Total	2100	1250

And Country A is using 4000 hours of labour and Country B is using 2000 hours of labour for producing above goods. And these number of hours are equally distributed between the two products.
So, no of hours spent per unit on each good

	Electric Bulbs	Head Phones
Country A	2.5	4
Country B	2	4

Country B produces Electric Bulbs in less time hence has less time.
Both countries produce a Head Phone using the same time hence no country has absolute advantage.

ix. for Country A,
Opportunity cost of producing Electric Bulbs = 2.5/4 = 0.625
Opportunity cost of producing Head Phones = 4/2.5 = 1.6

For Country B,
Opportunity cost of producing Electric Bulbs = 4/8 = 0.5
Opportunity cost of producing Head Phones = 8/4 = 2

For Electric Bulbs, since country B has lower opportunity cost, Country B has comparative advantage.
For Head Phones, since country A has lower opportunity cost, Country A has comparative advantage.

x. Country A has transferred to 400 hours of labour to Head Phones from Electric Bulbs. And Country B has transferred 400 hours of labour to Electric Bulbs from Head Phones.

The revised number of hours allocated to each product are as follows:

	Electric Bulbs	Head Phones
Country A	3600	4400
Country B	1400	600

The revised productivity is as follows:

	Electric Bulbs	Head Phones
Country A	1440	1100
Country B	700	150
Total	2140	1250

So, increase in productivity of Electric bulbs is 40 (2140 – 2100)
Increase in productivity of Head Phones is 0 (1250 – 1250)

xi. Yes. Agree.
- Electric bulbs have increased
- But Head Phones have not increased because both countries take the same 4 hours to produce it and both countries have exactly transferred 400 hours of labour to specialize. This made total hours of labour spend on Head Phones same. Hence the total Head Phones produced remained same.
- This is just a coincidence that both countries take same 4 hours to produce the good and transferred same 400 hours hence there is no increase in productivity.

xii. After the trade, the two countries will have the following goods with them.

	Electric Bulbs	Head Phones
Country A	1620	1000
Country B	520	250
Total	2140	1250

Country A has got 20 more Electric bulbs (1620 – 1600). Country B has got 20 more electric bulbs (520 – 500). So, both countries have got 20 Electric bulbs more and the same number of Head phones. Hence both countries are better off.

[15]
(Total 100 Marks)

*******END******