

Institute of Actuaries of India

Subject CT7 – Economics

29<sup>th</sup> October 2007

## **INDICATIVE SOLUTION**

### **INSTRUCTIONS TO MARKERS**

1. MARKS ARE ALLOTTED FOR EACH BIT OF QUESTION IN THE MAIN EXAM PAPER, AS WELL AS IN THE MODEL/INDICATED SOLUTIONS.
2. MARKERS ARE REQUESTED TO ALLOT MARKS AS PER THE SCHEME INDICATED BELOW.

PLEASE USE AN EXCEL SHEET (SOFTCOPY) WHEN MARKER'S SHEET IS FURNISHED TO IOAI—[SO THAT TOTALLING MISTAKES DO NOT TAKE PLACE, AND ALSO FOR FURTHER EVALUATION/RESEARCH OF SCRIPTS AT IOAI'S OFFICE AND REVIEW EXAMINER]

1. C
2. A
3. D
4. C
5. B
6. D
7. B
8. B
9. D
10. D
11. C
12. C
13. A
14. D
15. D
16. C
17. C
18. A
19. D
20. C. If a candidate has marked both (C) and (D), then also he should be given full marks.
21. D
22. C
23. B
24. B
25. B
26. C
27. A
28. A

29.

$$(a) IS: Y = C + I + G$$

[1 Mark]

$$Y = 300 + 0.4(Y-T) + 200 - 75i + 100$$

$$Y = 600 + 0.4Y - 0.4T - 75i$$

$$Y = 750 - 125i$$

[1 Mark]

(b)  $(M/P)^S = 450$

LM:  $(M/P)^d = (M/P)^S$

[1 Mark]

$$0.9Y - 450i = 450$$

$$Y = 500 + 500i$$

[1 Mark]

- (c) IS = LM  
 $750 - 125i = 500 + 500i$   
 $625i = 250$   
 $i = 0.4$  [1 Mark]  
 $Y = 500 + 500 \times 0.4 = 700$  [1 Mark]  
 $C = 300 + 0.4(700 - 375) = 430$  [1 Mark]  
 $I = 200 - 75 \times 0.4 = 170$  [1 Mark]
- (d) Fiscal expansion will shift outward the IS curve, driving both output and interest rate up. Since investment in this economy depends solely on the interest rate, this will imply investment reduction, not expansion [2 Marks]  
 Consider monetary expansion. This policy shifts the LM curve, resulting in an increase in output and decrease in interest rate. Lower interest rate leads to investment boom. The monetary expansion achieves both objectives. [2 Marks]
- (e) Monetary policy is ineffective in two cases: if IS curve is vertical (investment is completely unresponsive of interest rate), or LM is flat (the liquidity trap, demand for money is unaffected by the interest rate). [1.5 Marks]  
 There is no case in which fiscal policy is completely ineffective. Sometimes it is weak, as for example, if LM is very steep. Then fiscal policy would lead to huge interest rate swing with a modest effect on output. But the LM curve cannot be completely vertical because an increase in income will always have some effect as long as speculative demand for money is not constant which we rule out. [1.5 Marks]
- 30.
- (a) \$500 [1 Mark]  
 (b) \$2500 [1 Mark]  
 (c)  $400/500 = 0.8$  [1 Mark]

31.

The Phillips curve depicts an inverse relationship between the rate of unemployment and rate of inflation. The inverse relationship is reasonable, since in the absence of cost-push inflation, increases in the price level (and therefore inflation) should occur as output nears its full employment level (and unemployment approaches the natural rate of unemployment). [2.5 Marks]

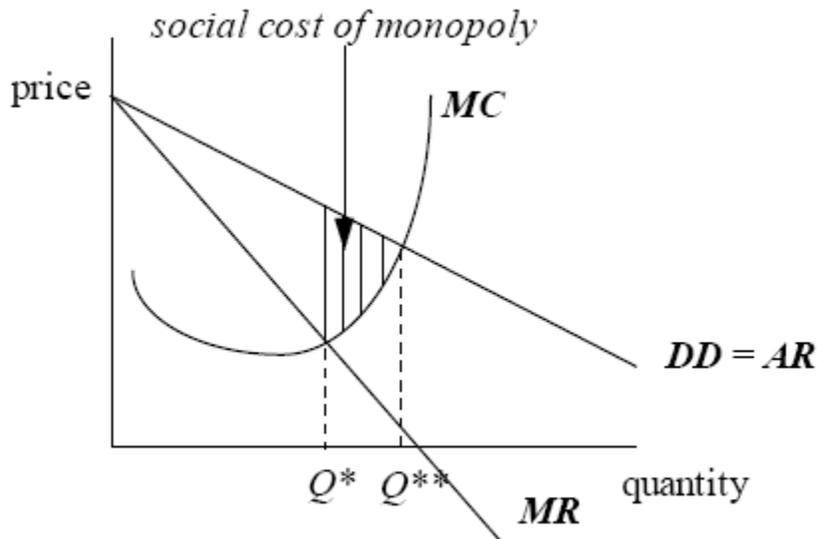
Shift of an aggregate demand curve along a positively sloped aggregate supply curve produce a positive relationship between output and price level. Increase in aggregate demand bring output closer to full employment but put upward pressure on the price level. Decrease in aggregate demand lower output and the price level. Since output is inversely related to the rate of unemployment, it follows that increases in aggregate demand along a positively sloped aggregate supply curve lower the unemployment rate and increase the inflation rate, while decrease in aggregate demand increase the unemployment rate while lowering the inflation rate. [2.5 Marks]

32.

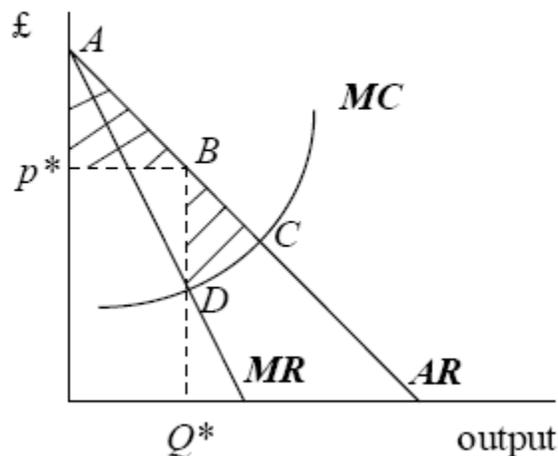
Under a fixed exchange rate system the rate of exchange is not allowed to vary. As a result, the elimination of a deficit or surplus can only be accomplished through income and price changes or government control on trade and payments. To do this, the deficit nation should deflate the economy (so as to discourage imports) and make sure that domestic prices rise less than in surplus nations (so as to encourage exports). On the other hand, the surplus nation should stimulate the economy in order to encourage imports and discourage its exports. If nations are unwilling to do this, a deficit can only be corrected by direct government restriction on imports of goods and services and loans and investments from abroad. [3 Marks]

A deficit in a nation's balance of payment means that at a given rate of exchange, there is a shortage of the foreign currency. If the exchange rate is freely flexible, the exchange rate will rise until the quantity demanded of foreign currency equals the quantity supplied and the deficit is completely eliminated. This rise in the exchange rate means that the relative value of domestic currency is falling or depreciating. The exact opposite happens when there is a surplus and the nation's currency appreciates in relative value. [3 Marks]

33.



a) The profit-maximising output under monopoly is  $Q^*$ , but the socially optimal output level is  $Q^{**}$ . So output under a monopoly is too low for social welfare maximisation. The reduction in social welfare is shown as the shaded area. It is called the “social cost” or “dead-weight burden” of monopoly. It is found by integrating the distance between the demand curve and the marginal cost curve over the range  $Q^*$  to  $Q^{**}$ . [2 Marks]



- b) If the firm charged the same price to each customer, it would produce output  $Q^*$  at a price of  $p^*$ . If the firm were able to price discriminate perfectly, it would produce at point  $C$ , where  $MC$  crosses  $AR$ . Its extra profits would be measured by the shaded triangles  $p^*AB$  (extra revenue from selling  $Q^*$ ) and  $BCD$  (profit from selling additional output). (2 marks)

#### Practical ideas

- It can charge lower for the call rates during off peak hours
- It can charge different rates to students Vs business people as they would have different timing and patterns and elasticities of usage (1/2 mark each)

- c)
- (i) There are large number of firms in the market
  - (ii) Each firm has the same product. This means that no company has a differentiated product in terms of brand, in terms of service, in terms of coverage etc. This implies that if one company decides to increase call rates, people will migrate to other companies
  - (iii) Consumers have perfect information. This means that Consumers are aware of all the call charges and plans, and there are no hidden charges.
  - (iv) Customers act rationally. This would imply that customers would choose the providers which have the lowest call rates
  - v) Free entry and exit of firms. This means that companies don't collude with each other to keep up the prices. For example, companies can't act in collusion to set the level of prices at high levels.

(Max 3 marks)

34

a) For both the companies, irrespective of what the other company chooses, they will adopt highly polluting strategies which is the dominant equilibrium here. (2 marks)

b) The above pay off matrix demonstrates that companies if acting in isolation to pursue their own interests might lead to damage to the society through their actions. Above example also demonstrates that non-collusion is not always good for the society. Had the companies known about each other's actions in installing low pollution mechanisms, they would have had the same pay offs and the society would have been better off. The other solution to this problem could have been an external intervention to rectify the issue (2 marks)

c) Revised pay off matrix

		IOC		
		Low pollution	High pollution	
RIL	Low pollution	(150,150)	(20,70)	
	High pollution	(70,20)	(50,50)	(1 mark)

There is no dominant strategy now (1mark)

d) X would be decided on basis of the larger difference in the following pay offs

$$120-100=20 \text{ or } 100-(-30)=130. \text{ 130 is a bigger difference}$$

Hence minimum X would be found by the following equation

$$100-X=-30+X$$

$$X=65$$

Hence the revised pay off matrix

		Low pollution	High pollution
RIL	Low pollution	(165,165)	(35,55)
	High pollution	(55, 35)	(35,35)

Hence X=65 just about makes the low pollution strategy dominant for both players

[2 Marks]

35.

a) Probability of winning the gamble =  $52/52 * 3/51 * 2/50 = .002353$  (1.5 marks)

Expected payoff from the gamble =  $.002353 * 400 * 10,000 = \text{INR } 9411.7$

Expected payoff (9411.7) < Amount staked, hence not a fair gamble (.5 mark)

b) The expected utility derived from this gamble is  $E(U(w)) = .002353 * b * (400 * 10000)^2$

The certainty equivalent would be derived by solving the equation

$$U(wc) = E(U(w))$$

$$bwc^2 = .002353 * b * (400 * 10000)^2$$

$$wc = (400 * 10000) \text{SQRT}(.002353) = \text{INR } 194031 \quad (2 \text{ marks})$$

Because certainty equivalent is greater than initial amount staked (10,000), Sev Anand derives extra utility from gambling. He is therefore a risk lover who would be ready to take on this unfair gamble also (1 mark)

c) Sev Anand would like to take on this gamble as long as the certainty equivalent is more than the initial amount staked (1 mark)

Lets assume the payoff on this gamble is X

Hence to calculate X, we have to solve the equation

$$b * 10,000^2 = .002353 * b * (X * 10,000)^2$$

$$X = \text{SQRT} (1/.002353) = 20.6 \text{ times} \quad (2 \text{ marks})$$

d) GRAPH (2 marks)

e) To calculate the certainty equivalent we use the equation

$$U(wc) = E(U(w))$$

$$bwc^2 = 999/1000 * b * (40,00000)^2 + 1/1000 * b * (100 * 10000000)^2$$

$$wc = \text{INR } 3,1874504 \quad (1.5 \text{ marks})$$

Hence Sev Anand would play the gamble because his certainty equivalent is more than the initial amount invested. (.5 marks)

Risk appetite for Sev Anand is so high that he would be ready to play such an unfair gamble where the payoff is 100 times only when compared with the fact that chances of success are 1 in thousand

(1 mark)

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