DSE 2004 Answer Key
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Part I

1.(b) only proposition (i) is true

2.(b) there exists a solar system in the milky way galaxy such that every planet in it has a moon revolving around it without any life forms

3.(c) $x_1 = y_1$, for $x_1 \in [0, 1000]$

4.(c) $x_1 = y_1$, for $x_1 \in [0, 1000]$

5.(d) both α and β are pareto efficient

6.(b) $x_1 = 999$ and $y_1 \in [999, 1000]$

7.(a) (1,0)

8.(c) $s_1 = (3-4c)/(3-2c)$ and $s_2 = 2c/(3-2c)$

9.(b) no

10.(a) $\frac{1}{2}$

11.(d) produce nothing in Plant 1

12.(c) $\frac{1}{4}$

13.(a) $(-5/2,\ 0)$

14.(d) $\sqrt{200} - 10$

15.(b) $((10-\sqrt{200})/4, (10-\sqrt{200})/6)$

16.(a) deficit decreases by $15 - \sqrt{200}$

17.(d) removing the water subsidy and providing a lump-sum subsidy.

18.(b) $\dfrac{\mu\beta + \alpha}{P[\mu(1-c) + \alpha\lambda]}$

19.(e) $\dfrac{\mu}{[\mu(1-c) + \alpha\lambda]}$

20.(d) $Y = f(\frac{1}{2})$

21.(b) $\max\{W_0, P/2\}$

22.(a) $\min\{\frac{1}{2}, 1 - W_0/P\}$

23.(c) $f(\frac{1}{2})$

24.(c) Y does not decrease and P increases

25.(b) Y does not increase and P decreases

26.(c) 2/3

27.(d) 3/32

28.(a) 2/3

29.(c) 7.4

30.(d) $2p^2$

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Part II

1. (A) Effect of a marginal increase in G on AD:
$Y = C(Y-T) + I(r) + G$, $M/P = L(Y, r)$
Differentiating totally,
$(1 - C_Y)dY - I_r dr = dG$
$L_Y dY + L_r dr = dM/P$
Solving,
$dY/dG = L_r/(L_r(1 - C_Y) + I_r L_Y)$
Refer book for explanation

   (B) Refer book for explanation

2. (A) (a) $np(1-p)(p^{n-2} + (1-p)^{n-2})$
   (b) $(1 - np(1-p)(p^{n-2} + (1-p)^{n-2}))^{k-1}$
   $\times\ (np(1-p)(p^{n-2} + (1-p)^{n-2}))$

   (B) (a) $a = 1/48$
   (b) 7/24
   (c) 3/4

3. (A) $f(x_1, x_2) = x_2 g(x_1/x_2)$ (by CRS)
$\text{MP}_1 = g'(x_1/x_2)$
$\text{MP}_2 = g(x_1/x_2) - (x_1/x_2)g'(x_1/x_2)$
$\text{MP}_{11} = (1/x_2)g''(x_1/x_2) < 0$
Hence, $\text{MP}_{12} = -(x_1/(x_2)^2)g''(x_1/x_2) > 0$
Similarly, $\text{MP}_{21} > 0$

   (B) For $a_{33} \neq 3$
Economic interpretation : For $a_{33} \neq 3$, the three securities when combined appropriately can generate any return.

   (c) To show : f is convex if and only if $\{(x, r)|f(x) \leq r\}$ is convex.
Suppose f is convex.
To show: $\{(x, r)|f(x) \leq r\}$ is convex
Let (x_1, r_1), (x_2, r_2) belongs to $\{(x, r)|f(x) \leq r\}$. So, $f(x_1) \leq r_1$ and $f(x_2) \leq r_2$ Take $0 < t < 1$, we want to show that $f(tx_1 + (1-t)x_2) \leq tr_1 + (1-t)r_2$ By convexity of function, $f(tx_1 + (1-t)x_2) \leq tf(x_1) + (1-t)f(x_2) \leq tr_1 + (1-t)r_2$.
Now suppose $\{(x, r)|f(x) \leq r\}$ is convex
To show: f is convex.
$(x_1, f(x_1))$ and $(x_2, f(x_2))$ belongs to $\{(x, r)|f(x) \leq r\}$. Since the set is convex, $(tx_1 + (1-t)x_2, tf(x_1) + (1-t)f(x_2))$ belongs to $\{(x, r)|f(x) \leq r\}$. This implies f is convex.

4. (A) (a) $\text{SC} = p_x x + (25p_y)/x$
   (b) $\text{LC} = 10\sqrt{p_x p_y}$
   (c) $x = 5\sqrt{\dfrac{p_y}{p_x}}$
   (d) $x = 3.5\sqrt{\dfrac{2p_y}{p_x}}$

   (B) Member 1 will veto b. Member 2 will veto d. Member 3 will veto c.