Statstrive ExamIQ

ISI MSQE PEA 2023 Question Paper

Regenerated from the local solution TeX source. Items missing full source detail are marked Needs Review.

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7	Microeconomics	Ready
8	Microeconomics	Needs Review
9	Macroeconomics	Ready
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13	Macroeconomics	Ready
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Contents

Question 1

Topic: Microeconomics **Difficulty:** Moderate **Status:** Ready

A consumer's budgetary allocation for two commodities x and y is m. Her demand for x is

$$x(p_x, p_y, m) = \frac{2m}{5p_x}.$$

Initially $m = 1000$, $p_y = 20$, $p_x = 5$. The price of x falls from 5 to 4. The substitution effect of the price change is:

(A) an increase in demand for x from 80 to 100

(B) an increase in demand for x from 90 to 100

(C) an increase in demand for x from 80 to 90

(D) an increase in demand for x from 80 to 92

Question 2

Topic: Microeconomics **Difficulty:** Moderate **Status:** Ready

	Year 1			Year 2	
	Qty	Price		Qty	Price
Good 1	100	100	Good 1	120	100
Good 2	100	100	Good 2	x	80

For which range of x is the consumer's behaviour inconsistent with WARP?

(A) $75 < x < 80$

(B) $x \geq 70$

(C) $70 < x < 75$

(D) $x \leq 75$

Question 3

Topic: Microeconomics **Difficulty:** Moderate **Status:** Ready

$p = 100 - q$, $q = \sum_{i=1}^{23} q_i$, $c_i(q_i) = \dfrac{q_i^2}{2}$. Cournot–Nash equilibrium:

(A) is not well defined

(B) each firm produces 3 units

(C) each firm produces 4 units

(D) each firm produces 5 units

Question 4

Topic: Microeconomics **Difficulty:** Moderate **Status:** Ready

$p = 100 - q$, $n = 10$ firms, $c_i(q_i) = q_i$. Total deadweight loss is

(A) $\frac{9^2}{2}$

(B) $\frac{9^2}{2}$

(C) $\frac{10^2}{2}$

(D) $\frac{100^2}{2}$

(The intended options correspond to $\frac{9^2}{2}$, $\frac{9^2}{2}$, $\frac{10^2}{2}$, $\frac{100^2}{2}$, the first being $\frac{9^2}{2}$.)

Question 5

Topic: Microeconomics **Difficulty:** Moderate **Status:** Ready

$p = 100 - q$; large number of identical firms with

$$c(q_i) = \begin{cases} 10 + 2q_i, & q_i > 0, \\ 0, & q_i = 0. \end{cases}$$

The competitive equilibrium price is:

(A) not well defined (B) 2 (C) 10 (D) 2.1

Question 6

Topic: Microeconomics **Difficulty:** Hard **Status:** Ready

$p = 100 - q$. Two firms with cost

$$c_i(q_i) = \begin{cases} 0, & q_i \le 10 \\ \infty, & q_i > 10 \end{cases}$$

i.e. each firm has capacity 10. Demands: undercut wins the market, ties split. Bertrand–Nash equilibrium:

(A) $(0, 0)$ (B) $(20, 20)$ (C) $(80, 80)$ (D) $(90, 90)$

Question 7

Topic: Microeconomics **Difficulty:** Hard **Status:** Ready

500 consumers uniform on $[0,1]$. Two hospital locations $a < b$. Travel cost = distance. Each individual values service at 4. Fixed cost per hospital = 300; marginal cost of treatment = 2. Optimal locations?

(A) no hospital (B) both at $1/2$ (C) $1/3, 2/3$ (D) $1/4, 3/4$

Question 8

Topic: Microeconomics **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Unit mass of consumers, valuation $\theta \sim F$ on $[\underline{\theta}, \overline{\theta}]$. Each buys 1 unit iff $\theta \geq p$. Inverse demand $p(q)$. Find $p'(q)$.

Question 9

Topic: Macroeconomics **Difficulty:** Moderate **Status:** Ready

Demand-determined output. Workers receive share λY, capitalists $(1-\lambda)Y$. Saving rates s_w (workers) and s_c (capitalists), with $s_w < s_c$. Investment $\bar{I}$ autonomous. If both s_c and s_w rise, in the new equilibrium:

(A) savings $\uparrow$, income $\downarrow$

(B) savings $\downarrow$, income $\uparrow$

(C) savings $\uparrow$, income unchanged

(D) savings unchanged, income $\downarrow$

Question 10

Topic: Macroeconomics **Difficulty:** Moderate **Status:** Ready

With saving rates unchanged but λ rising (more income to workers), the new equilibrium has:

(A) savings $\uparrow$, income $\downarrow$

(B) savings $\downarrow$, income $\uparrow$

(C) savings $\uparrow$, income unchanged

(D) savings unchanged, income $\downarrow$

Question 11

Topic: Macroeconomics **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

$Y = \bar{K}^{\alpha} L^{1-\alpha}$, $0 < \alpha < 1$. Perfectly competitive. Find L^d as a function of real wage W/P.

Question 12

Topic: Macroeconomics **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Household has endowment $\bar{L}$, supplies L^s, enjoys $\bar{L} - L^s$ leisure. $u = C^\beta + (\bar{L} - L^s)^\beta$, $0 < \beta < 1$. Budget: $PC = WL^s$. Find L^s as a function of W/P.

Question 13

Topic: Macroeconomics **Difficulty:** Easy **Status:** Ready

Given the labour demand and supply derived above, the aggregate supply curve is:

(A) upward sloping

(B) downward sloping

(C) vertical

(D) horizontal

Question 14

Topic: Macroeconomics **Difficulty:** Hard **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Goods market: $S(Y,r) = I(r)$ with $0 < S_Y < 1$, $S_r > 0$, $I_r < 0$. Money: $M/P = L(Y,r)$ with $L_Y > 0$, $L_r < 0$. Find dY/dP.

Question 15

Topic: Econometrics / Growth **Difficulty:** Easy **Status:** Ready

$g_i = \alpha + \beta_0 \log y_{i,0} + \beta_1 \log n_i + \beta_2 \log s_i + \gamma X_i + \varepsilon_i$. The Solow model predicts the sign of β_0:

(A) negative

(B) positive

(C) zero

(D) inconclusive

Question 16

Topic: Linear Algebra **Difficulty:** Easy **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

$$A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix}.$$

Rank of A?

Question 17

Topic: Probability **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Bowl A: 2 red. Bowl B: 2 white. Bowl C: 1 white, 1 red. A bowl is selected at random and a coin drawn at random. Given the drawn coin is white, what is the probability that the other coin in the bowl is red?

Question 18

Topic: Probability **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Choose $n \in \{1, 2, \ldots, 6\}$ uniformly, then choose $m \in \{1, \ldots, n\}$ uniformly. Probability that $m = 5$?

Question 19

Topic: Probability **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

$F(1.4) = 0.92$, $F(0.14) = 0.555$, $F(-0.2) = 0.42$, $F(-1.6) = 0.055$. Diameter $\sim N(\mu, \sigma^2)$. $P(\text{diam} < 1.8) = 0.08$ and $P(\text{diam} > 2.4) = 0.055$. Find μ.

Question 20

Topic: Calculus **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

f differentiable, f' strictly increasing. $f(1/2) = 1/2,\ f(1) = 1$. Compare $f'(1/2),\ 1,\ f'(1)$.

Question 21

Topic: Calculus **Difficulty:** Hard **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

$f(x) = \lfloor x \rfloor$. Evaluate $\displaystyle\int_0^{\sqrt{5}} f(x^2)\,dx$.

Question 22

Topic: Algebra / Combinatorics **Difficulty:** Easy **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Find the constant term in $\left(x+\frac{1}{x^2}\right)^{19}$.

Question 23

Topic: Probability **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Arjun and Gukesh each toss 3 fair coins. $p_1 = P(\text{Arjun's heads} > \text{Gukesh's heads})$. Find p_1.

Question 24

Topic: Algebra **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Find the number of real solutions of $x|x| + 1 = 3|x|$.

Question 25

Topic: Optimization / Number Theory **Difficulty:** Hard **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Positive integers $k_1, \ldots, k_n$ (not necessarily distinct) with

$$k_1 + \cdots + k_n = 5n - 4, \qquad \tfrac{1}{k_1} + \cdots + \tfrac{1}{k_n} = 1.$$

Maximum n?

Question 26

Topic: Combinatorics **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Monkey at $(0,0)$ in $\mathbb{R}^2$ jumps a distance of 5 to an integer point. Number of possible end positions?

Question 27

Topic: Probability **Difficulty:** Moderate **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

Strip of $n+2$ squares; squares 1 and $n+2$ are black; squares $2, \ldots, n+1$ are white. Girl picks a white square uniformly, then picks one of its two neighbours uniformly. Probability the neighbour is white?

Question 28

Topic: Calculus **Difficulty:** Moderate **Status:** Ready

$f(x) = \max(|x|, x^2)$ for all $x \in \mathbb{R}$. Which is true?

(A) f is increasing

(B) f not continuous

(C) f continuous but not differentiable

(D) f decreasing

Question 29

Topic: Convex Analysis **Difficulty:** Hard **Status:** Ready

With f as in Q28, $D = \{(x, y) \in \mathbb{R}^2 : y \geq f(x)\}$ (epigraph of f). Which is true?

(A) $\mathbb{R}^2 \setminus D$ is convex

(B) $\mathbb{R}^2_+ \setminus D$ is convex

(C) D is not convex

(D) None of the above

Question 30

Topic: Functional Equations **Difficulty:** Hard **Status:** Needs Review

Review note: source TeX does not provide a full four-option MCQ block.

$f : [-1, 1] \to \mathbb{R}$ with

$$f(x) = f\left(\frac{2 - x^2}{2}\right) \cdot \frac{x^2}{2 - x^2} \quad \text{... [as printed]}$$

(Standard interpretation: $f(x) = f\left(\frac{2x^2}{2 - x^2}\right)$ or similar.) Find $f(-1)$.