

DSE 2022 MA Economics Entrance

1. Let the support of a mixed strategy refer to the set of pure strategies that are played with positive probability in the mixed strategy. Which one of the following is TRUE for a Nash equilibrium mixed strategy?
 - A. No strictly dominated pure strategy will belong to the support of a Nash equilibrium mixed strategy
 - B. No weakly dominated pure strategy will belong to the support of a Nash equilibrium mixed strategy
 - C. No dominant pure strategy will belong to the support of a Nash equilibrium mixed strategy
 - D. If there is a dominant strategy in the support of a Nash equilibrium mixed strategy, then there cannot be other dominant strategies in this support.

2. A monopolist with unknown cost function faces the demand function $Q = 100 - 4P$. Which of the following choices of output CANNOT be a profit maximising choice?
 - A. 60
 - B. 25
 - C. 35
 - D. 45

3. Geeta's utility function over goods x and y is $u_G(x, y) = \min\{x, y\}$, while Sara's utility function over these two goods is $u_S(x, y) = \max\{x, y\}$. Geeta has an endowment of 5 units of good x and none of good y , while Sara has an endowment of 5 units of good y and none of good x . Which of the following statements is TRUE for this exchange economy:
 - A. There is a competitive equilibrium where prices of both goods are strictly positive.
 - B. There is a finite number of Pareto optimal allocations.
 - C. There is a competitive equilibrium where Sara does not consume anything at all.
 - D. There is a competitive equilibrium where Geeta does not consume anything at all.

4. Which of the following choices is consistent with Weak Axiom of Revealed Preference:
 - A. Bundle (6, 3) is chosen at prices (1, 1) and bundle (3, 5) is chosen at prices (2, 3)
 - B. Bundle (6, 3) is chosen at prices (2, 3) and bundle (3, 5) is chosen at prices (1, 1)

- C. Bundle (2, 3) is chosen at prices (3, 5) and bundle (3, 2) is chosen at prices (5, 3)
- D. Bundle (3, 5) is chosen at prices (2, 3) and bundle (5, 3) is chosen at prices (3, 2)
5. Suppose three identical firms with constant marginal cost c compete in quantities in a market in which inverse demand is given by $P = a - bQ$. What will be the Cournot-Nash equilibrium price and total quantity (P^*, Q^*) ?
- A. $\left(\frac{3a+c}{4}, \frac{a-c}{4b}\right)$
- B. $\left(\frac{a-3c}{4}, \frac{3(4-c)}{4b}\right)$
- C. $\left(\frac{a+3c}{4}, \frac{3(a-c)}{4b}\right)$
- D. $\left(\frac{a+c}{4}, \frac{a-c}{4b}\right)$
6. An indivisible item is to be allocated to the highest bidder out of 7 bidders subject to a reserve price of $\frac{1}{2}$, i.e., only bids above this amount will qualify; bidders values for the object are independently drawn from the uniform $[0, 1]$ distribution. If bidders bid their own valuation, what is the probability that the item will not be allocated?
- A. $\frac{1}{2}$
- B. $\frac{11}{16}$
- C. $\frac{127}{128}$
- D. $\frac{10}{99}$
7. Consider a profit maximizing firm producing a single output from two inputs. Let $\mathbf{p} \in \mathbf{R}_{++}^3$ denote a price vector whose first component is the output price and the second and third components are the input prices. Let $\pi(\mathbf{p})$ denote maximum profit at price vector \mathbf{p} . Which of the following statements must necessarily be TRUE regardless of the technology the firm is using?
- A. $\pi(2, 1, 3) \geq \pi(1, 2, 3)$
- B. $\pi(3, 4, 5) > \pi(4, 5, 3)$
- C. $\pi(2, 2, 2) > 2\pi(1, 1, 1)$
- D. $\pi(2, 3, 4) > \frac{1}{2}\pi(1, 2, 3) + \frac{1}{2}\pi(3, 4, 5)$

8. The following data has been obtained from two firms:

Firm	y	w_1	w_2	x_1	x_2
Firm 1	100	2	1	10	20
Firm 1	110	1	2	14	10
Firm 2	90	2	1	14	10
Firm 2	100	1	2	10	20

Which of the following statements is TRUE given this data?

- A. Only firm 1's behaviour is consistent with cost minimization

- B. Only firm 2 's behaviour is consistent with cost minimization
- C. Both firms' behave consistently with respect to cost minimization
- D. None of the firms behave consistently with respect to cost minimization
9. Consider an exchange economy with two agents having identical preferences given by $u(x_1, x_2) = \sqrt{x_1 x_2}$. Agent 1 has an endowment of 5 units of good 1, and 0 units of good 2, and agent 2 has an endowment of 5 units of good 2, and 0 units of good 1. If a social planner wants to redistribute endowments such that agent 2 gets twice as much utility as agent 1 in a competitive equilibrium, the amount of good 1 to be transferred from agent 1 to 2 is:
- A. $\frac{1}{2}$ units
- B. $\frac{2}{3}$ units
- C. $\frac{5}{3}$ units
- D. 2 units
10. A power producer produces electricity to meet the demands of a city. During the day (7:00 A.M. to 7:00 P.M.), 4 units are demanded, whereas during the night (7:00 P.M. to 7:00 A.M.) only 3 units are demanded. The price for electricity is fixed and all demand must be met at that price. The utility produces electricity according to the production function

$$y_i = \sqrt{KF_i}, i = \text{day, night}$$

where K is the size of the generating plant, and F_i is tons of fuel. The firm must build a single plant, it cannot change plant size from day to night. If a unit of plant size costs w_k per 24hour period and a ton of fuel costs w_f , what size plant will the utility build?

- A. $6\sqrt{w_f w_k}$
- B. $6\sqrt{\frac{w_f}{w_k}}$
- C. $5\sqrt{\frac{w_f}{w_k}}$
- D. $7\sqrt{w_f w_k}$
11. Two agents are deciding how fast to drive their cars. Agent i chooses speed x_i and gets utility x_i^2 from this choice. The probability that they are involved in a mutual accident is $1 - \frac{1}{501x_2}$. The accident, if it occurs, imposes a cost of 2 and 3 on agents 1 and 2 respectively. Assume that each agent's utility is linear in money. Consider the following statements:
- Without any intervention, agents 1 and 2 drive at identical speed levels when maximizing their expected utility
 - The socially optimal speed is identically $\sqrt[4]{\frac{5}{2}}$

- If a social planner wanted to implement the efficient speed levels through imposing fines that are linear in speed, the sum of such optimal fines over the agents is greater than the sum of accidental costs.
 - Only (i) is true
 - Only (ii) is true
 - Only (ii) and (iii) are true
 - All of the options are true

12. Agent X can choose between x_1 and x_2 , agent Y can choose between y_1 and y_2 . When X choose x_i and Y chooses y_j , X gets a payoff of $\sin(x_i + y_j)$ while Y gets $\cos(\pi - (x_i + y_j))$, $i, j \in \{1, 2\}$. It is given that $x_i, y_j \in (0, \frac{\pi}{4})$ for all $i, j \in \{1, 2\}$.

Consider the following statements.

- If $x_1 > x_2$ and $y_1 > y_2$, (x_1, y_1) is a unique Nash equilibrium
- If $x_1 > x_2$ and $y_1 < y_2$, (x_1, y_2) is a unique Nash equilibrium
- If $x_1 < x_2$ and $y_1 > y_2$, there are at least two Nash equilibria in pure strategies.
 - Only (i) is true
 - Only (ii) is true
 - Only (i) and (ii) are true
 - All of the options are true

Read the passage and answer the following three questions.

Consider a closed economy where at any period t the actual output Y_t is demand-determined. Aggregate demand has three components:

- a consumption demand function that depends on current income: $C_t = 10 + (1/2)Y_t$;
- an investment demand function that depends on the interest rate r which is set by the government: $I_t = (5/r)$;
- an autonomous government expenditure: $G_t = G$.

Suppose initially the government sets $r = (1/4)$ and $G = 0$.

13. The equilibrium output level is equal to
- 40
 - 50
 - 60
 - 70

14. Now suppose the government wants to attain the full-employment level of output, given by $Y^F = 100$. If it wants to attain the full-employment by means of fiscal policy (keeping the interest rate unchanged at the initial level), then it has to raise the amount of government expenditure G to
- A. 10
 - B. 20
 - C. 30
 - D. 40
15. Alternatively, if the government wants to attain the full-employment level of output $Y^F = 100$ by means of monetary policy (keeping the government expenditure unchanged at the initial level), then it has to lower the interest rate to
- A. $1/8$
 - B. $1/7$
 - C. $1/6$
 - D. $1/5$
16. A consumer, who lives for two periods - 1 and 2, has her lifetime utility function given by $U = (c_1)^\pi + \beta (c_2)^\sigma$, where $0 < \sigma < 1$. The consumer earns incomes w_1 and w_2 in the two periods and her lifetime budget constraint is: $c_1 + (c_2)/(1+r) = w_1 + (w_2)/(1+r)$, where r denotes the interest rate on savings. If $\beta(1+r) > 1$, it follows that
- A. $c_1 > c_2$
 - B. $c_1 < c_2$
 - C. $c_1 = c_2$
 - D. the relationship between c_1 and c_2 is ambiguous

Read the passage and answer the following question two questions.

Consider an economy where the final commodity is produced by a single monopolist firm using only labour. The price-setting firm charges a 25% mark-up over the nominal wage rate. On the other hand, the workers demand a real wage rate which is inversely related to the unemployment rate, such that: $W/P = (1 - u)$ (where, u = the unemployment rate, P = Price and W = nominal wage rate).

17. The equilibrium unemployment rate in this economy is equal to:
- A. 20%
 - B. 15%
 - C. 10%
 - D. 5%
18. Now suppose the market power of the monopolist firm goes down so that it can charge a mark-up of only 20% over the nominal wage. What will be the impact on the equilibrium rate of unemployment?

- A. Equilibrium unemployment rate will go up
 B. Equilibrium unemployment rate will go down
 C. Equilibrium unemployment rate will remain unchanged
 D. The impact on equilibrium unemployment rate is ambiguous
19. Consider the Solow growth model with a fixed savings ratio, a constant population growth rate, zero rate of capital depreciation and no technical progress. Let k^* denote that steady state value of capital-labour ratio in this economy. Suppose the economy is yet to reach the steady state and sitting at a capital-labour ratio k_1 at time t_1 , and at a capital-labour ratio k_2 at time t_2 , such that $k_1 < k_2 < k^*$. Let the associated growth rates of per capita income at time t_1 and t_2 be denoted by g_1 and g_2 respectively. Then, by the properties of the Solow model,
- A. $g_1 < g_2$
 B. $g_1 > g_2$
 C. $g_1 = g_2$
 D. the relationship between g_1 and g_2 is ambiguous
20. Suppose in an economy the labour demand function is represented by $N^D(w) = 1 - w$ while the labour supply function is given by $N^S(w) = 2w$, where w denotes the real wage rate, Consider an aggregate production function: $Y = (N)^{1/2}$, where N is the equilibrium level of employment. If the real wage adjusts so that the labour market is always in equilibrium, the aggregate supply curve in this economy will be given by
- A. $Y = 1$
 B. $Y = (1 + w)^{1/2}$
 C. $Y = \left[\frac{1-w}{2w}\right]^{1/2}$
 D. $(2/3)^{1/2}$

Read the following passage and answer the next three questions.

Consider an economy where output Y_t is produced using using two factors: labour (N_t) and land (X_t). The production function is give by: $Y_t = A (N_t)^{1/2} (X_t)^{1/2}$, where A is an index for technology, Let us assume that $A = 1$. The economy has a fixed supply of land given by $X_t = 1$. The labourforce however changes over time due to population growth. Rate of growth of population in turn depends on the level of per capita income ($y_t \equiv Y_t/N_t$) such that $(1/N_t) (dN_t/dt) = y_t - 100$

The steady state of this economy is characterised by $dN_t/dt = 0$ which implies a constant labourforce/employment and therefore a constant output level.

21. The economy has a non-zero steady state given by
- A. $N^* = 1; Y^* = 10$.
 B. $N^* = 1/100; Y^* = 1$.
 C. $N^* = 9; Y^* = 30$

- D. $N^* = 16; Y^* = 40$
22. Starting from a non-zero initial labourforce $N_0 = 1/50$,
- the labourforce in the economy will increase in the short run
 - the labourforce in the economy will decrease in the short run
 - the labourforce in the economy will not change in the short run
 - the labourforce in the economy will change in a random manner in the short run
23. Suppose due to some scientific discovery, the technology index increases, such that now $A = 10$. Correspondingly, in the new steady state, the economy has
- higher output and lower employment
 - higher output and higher employment
 - Higher output and same level of employment as before
 - Same level of output and employment as before
24. According to the Quantity Theory of Money, an exogenous increase in money supply
- will increase both the price level and output level
 - will increase the price level but reduce the output level
 - will increase the price level but the output level will remain unchanged
 - will increase the output level but the price level will remain unchanged
25. In the context of the Solow model, the Golden Rule refers to a situation where
- the steady state growth rate is maximised
 - the steady state level of per capita output is maximised
 - the steady state level of per capita consumption is maximised
 - the steady state level of per capita savings is maximised
26. The circle passing through $(1, -2)$ and touching the horizontal axis at $(3, 0)$ also passes through
- $(2, -5)$
 - $(5, -2)$
 - $(-2, 5)$
 - $(-5, 2)$
27. Consider the set $S = \{(x, y, z) | y = |x|\}$ in \mathbb{R}^3 (real coordinate space of dimension 3). Which of the following set will make $S \cup T$ a convex set?
- S is a convex set. So $T = \emptyset$.
 - $T = \{(x, y, z) | y \leq x\}$

C. $T = \{(x, y, z) \mid y \geq x\}$

D. $T = \{(x, y, 0)\}$

28. Suppose $A = \begin{pmatrix} 5a & -b \\ 3 & 2 \end{pmatrix}$ and $A \cdot \text{adj}(A) = AA^T$. Here A^T denotes the transpose of A and $\text{adj}(A)$ denotes the adjoint of A . Which of the following is true?

A. A can be uniquely identified.

B. Two different A will satisfy the requirement.

C. There is no such A .

D. There are infinitely many A that satisfy the requirement.

29. Consider the following system of linear equations:

$$x + \lambda y - z = 0$$

$$\lambda x - y - z = 0$$

$$x + y - \lambda z = 0$$

The system above has a non-zero solution for

A. Exactly one value of λ .

B. Exactly two values of λ .

C. Exactly three values of λ

D. infinitely many values of λ .

30. Two players A and B are playing the following game. In each round one of the players draws a number randomly from an urn containing numbers $0, 1, 2, \dots, 9$. Suppose that player A is drawing at round t . If she draws a positive even number then she continues to draw at round $(t + 1)$. However, if A draws an odd number at t then player B gets to draw at round $(t + 1)$. If 0 is drawn then the game ends. Rules are the same for both players. Suppose that A starts the game. Find the probability that the game ends with at most one player change.

A. $\frac{1}{10}$

B. $\frac{3}{8}$

C. $\frac{11}{36}$

D. $\frac{17}{60}$

31. The Euclidean distance of the point $(1, -5, 9)$ from the plane $x - y + z = 5$ measured parallel to the line $x = y = z$ is

A. $10\sqrt{3}$

B. $\frac{10}{\sqrt{3}}$

C. $3\sqrt{10}$

D. $\frac{3}{\sqrt{10}}$

32. Let $y(x)$ be solution of the differential equation: $(x \ln x) \frac{dy}{dx} + y = 2x \ln x$, with $x \geq 1$. Then the value of $y(e)$ is?
- A. e
 - B. $2e$
 - C. 2
 - D. $\ln 2$
33. Consider the equation $2x^3 + 6x + k = 0$. For what value of k the equation has two distinct roots in the interval $[0, 2]$?
- A. k lies between -4 and 0
 - B. k lies between 0 and 4
 - C. k is greater than 4
 - D. There is no such k .
34. Find $\sum_{n=2}^{\infty} \frac{1}{n^2-1}$.
- A. $\frac{1}{2}$
 - B. $\frac{3}{4}$
 - C. $\frac{4}{3}$
 - D. This series does not converge.
35. A triangle has two vertices at $(-5, 2)$ and $(1, 5)$. If the altitude through these vertices intersect at $(1, -2)$ then find the coordinate of the third vertex
- A. $(-1, -1)$
 - B. $(-1, 1)$
 - C. $(1, 2)$
 - D. $(-1, 2)$
36. Suppose that $f(x)$ is differentiable for all $x > 0$ and f satisfies the following for each $x > 0$.
- $$\lim_{t \rightarrow x} \left[\frac{t^3 f(x) - x^3 f(t)}{t-x} - e^{t-x} \right] = 0$$
- If $f(1) = 0$ then the value of $f(x)$ is?
- A. $f(x) = -\frac{1}{3} [x^3 - x^{-2}]$
 - B. $f(x) = -\frac{1}{2} [x^3 - x^{-1}]$
 - C. $f(x) = -\frac{1}{3} [e^x - x^{-2}]$
 - D. $f(x) = -\frac{1}{4} [e^x - x^{-1}]$

37. You randomly drew four numbers between 1 and 2022 without replacement from a basket. Call these numbers a, b, c and d in order of the draw. What is the probability that the following system of equations have a solution strictly inside the first quadrant, given that it has a solution?

$$ax + by = ab$$

$$cx + dy = cd$$

- A. $\frac{\binom{2022}{3}}{\binom{2022}{4}}$
- B. $\frac{\binom{2022}{2}}{\binom{2022}{4}} + \frac{\binom{2022}{3}}{\binom{2022}{4}}$
- C. $2^{1011}/4^{2022}$
- D. $\frac{1}{2}$
38. The following regression model, estimated using ordinary least squares, yields the following $\ln W = 7.0 + 0.08E + 0.03R + 0.01F$ where W refers to wages in —per day, E refers to the number of years of education, R is a dummy variable taking value 1 if the person lives in a rural area, and F is a dummy variable taking value 1 if the person is a woman. You may assume that all coefficients are statistically significant. Which of the following is most correct?
- A. An additional year of education translates into a 8 percentage point increase in wages irrespective of gender and residence
- B. An additional year of education translates into a 80 paise increase in daily wages irrespective of gender and residence
- C. An additional year of education translates into a 12 percentage point increase in wages for rural women
- D. An additional year of education translates into Rs. 1.20 increase in daily wages for rural women
39. Consider a linear regression model where all the classical assumptions are met, but errors are heteroscedastic. Which of the following statements is false?
- A. Heteroscedasticity can mean that the conditional variance of the dependent variable is a function of the independent variables.
- B. OLS coefficients will be biased.
- C. The usual OLS variance formula for estimated coefficients will be incorrect.
- D. Knowledge of the nature of heteroscedasticity can lead to efficient estimation
40. Consider the regression model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + u$ where X_1 is X_1 divided by its standard deviation σ_1 . Similarly $X_2 = \frac{X_2}{\sigma_2}$. Say the estimated β_1 is positive. All else remaining equal, which of the following is correct?
- A. A unit increase in X_1 will lead to a β_1 standard deviation increase in Y .
- B. A one standard deviation change in X_1 will lead to a β_1 units increase in Y .

- C. A unit increase in X_1 will lead to a β_1 units increase in Y .
- D. A one standard deviation increase in X_1 will lead to a β_1 standard deviation increase in Y .
41. Suppose you have 100 distinct positive observations. Consider the following:
- I. Arithmetic Mean
 - II. Interquartile Range
 - III. Geometric Mean
 - IV. Median
- Suppose the value of the observation at the 5-th percentile is mistakenly entered. It is in fact the same as the value of the observation at the 10 -th percentile. Once this correction is made, which of the following will necessarily remain unaffected?
- A. All of them (i.e. I., II. III., and IV)
 - B. Only II., III. and IV.
 - C. Only II. and IV.
 - D. Only II., III.
42. A firm has come up with a new rapid test for Covid. If a person has Covid, the test will indicate it with probability 0.998. If the person does not have Covid, the test will indicate this with probability 0.002. We also know that 0.1 percent of all people have Covid. A randomly selected person has tested Covid positive using this new test. What is the probability that the person actually has Covid?
- A. 0.40
 - B. 0.33
 - C. .04
 - D. 0.03
43. Suppose a random variable X has mean 3 and variance 4. You have no information on its distribution. What is the lower bound for the probability $P[-2 < X < 8]$?
- A. .90
 - B. 0.75
 - C. 0.84
 - D. We cannot determine the answer without knowledge of the distribution of the random variable.
44. A random point (X, Y) is distributed uniformly on a square with vertices $(1, 1)$, $(1, -1)$, $(-1, 1)$ and $(-1, -1)$. The probability $P(2X - Y > 0)$ is given by:
- A. 1.00
 - B. Zero

C. .33

D. 0.50

45. Members of the Economics Club of your college are 50 percent from the third year, 30 percent from second year, and 20 percent from the first year. It is known that 5 percent of first year, 10 percent of second year, and 12 percent of third year students quit the Club midway. If a student quits the club, what is the probability that s/ he is a third year student?

A. 0.12

B. 0.24

C. 0.60

D. 0.45

46. A bowl has 5 chips, three are marked with Rs. 1 and two are marked with Rs, 4. Rita draws two chips at random (without replacement) and is paid the sum of the value of the two chip What is Rita's expected payout?

A. Rs. 2.50

B. Rs. 4.40

C. Rs. 5.00

D. Rs. 2.90

47. You purchase a headphone. The product manual says the lifetime T of the product, defined as the number of years t before it stops working is given by: $P(T \geq t) = \frac{1}{2t}$, for all $t > 0$.

The headphone you purchased has worked perfectly for 3 years, What is the probability it will break down in the fourth year?

A. $\frac{1}{6}$

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{3}{4}$

48. Consider two disjoint events A and B in a sample space S .

Which of the following is most correct?

A. A and B are always independent.

B. A and B cannot be independent.

C. A and B are independent if exactly one of them has positive probability.

D. A and B are independent if both of them have positive probability.

49. We have observations $i = 1, \dots, n$, independently drawn from identical distributions with finite expectation of μ . Consider the following statements:

- I. The sample mean has the lowest variance among all the linear unbiased estimators of μ .
- II. When draws are from a standard normal distribution, the sample mean has the lowest variance among all the linear unbiased estimators of μ .
- III. When draws are from a standard normal distribution, the sample mean is an unbiased estimator of μ .
- IV. All of the above.

Which of the following is/are most correct?

- A. All I, II, III, and IV
- B. Only II and IV
- C. Only III
- D. Only II, III, and IV

50. Consider the following statements:

- I. The sum of squares of residuals from a regression can remain the same with addition of regressors
 - II. The sum of squares of residuals from a regression can increase with addition of regressors
 - III. Regression of the logarithm of a variable on only a constant 1 gives the geometric mean as the coefficient
 - IV. Regression of a variable on only a constant 1 gives the arithmetic mean as the coefficient
- Which of the following is true (suppose the variables comprise of only positive numbers):

- A. Only I. and IV.
- B. Only IV.
- C. Only I., II, and IV.
- D. Only III. and IV.