MA Economics Entrance Examination
ASHOKA UNIVERSITY

Syllabus and Sample Questions

1 General Instructions

1. The entrance exam will be of a multiple choice format.
2. The exam will be of two hours duration and consist of 40 questions.
3. Each correct answer will earn you 1 point and each wrong answer will cost you 0.25 points. That is, there is negative marking.
4. You will not be allowed to use calculators or any other electronic device during the course of the exam.
5. The entrance will have questions from Statistics, Mathematics and Logical/Analytical Reasoning. Syllabus and sample questions are provided below.

2 Statistics

2.1 Syllabus

Topics: Measures of Central Tendency and Dispersion; Elementary Probability Theory; Random variables; Special Discrete Distributions like Binomial, Hypergeometric and Negative Binomial; Special Continuous Distributions like Uniform and Normal; Joint Discrete Distributions; Sampling Distributions,

Interval, Point Estimation and Hypothesis Testing for Population Means, Proportions and Variances.

Recommended Textbooks: (i) "Probability and Statistics for Engineering and the Sciences" by J.L. Devore. Seventh Edition. (ii) "John E. Freund's Mathematical Statistics with Applications" by Miller and Miller. Eighth Edition.

2.2 Sample Questions

1. Your neighbour has 2 children. You learn that he has a son, Joe. What is the probability that Joe's sibling is a brother?

   (a) 1/2

   (b) 1/3

   (c) 1

   (d) 2/3

2. Two cards from an ordinary deck of 52 cards are missing. What is the probability that a random card drawn from this deck is a spade?

   (a) 1/4

   (b) 1/2

   (c) 1/5

   (d) 1/13

3. Suppose you and a friend play a game. Two standard, fair, six-sided dice are thrown, and the numbers appearing on the dice are multiplied together. If this product is even, your friend gives you a quarter, but if this product is odd, you must give your friend one dollar. What is the expected value of this game for you?

   (a) 6.25 cents

(b) -6.25 cents

(c) -75 cents

(d) 75 cents

4. Consider a positively skewed distribution. Find the correct answer on the position of the mean and the median:

   (a) Mean is greater than median

   (b) Mean is smaller than median

   (c) Mean and median are same

   (d) None of the above

5. Let A and B be two mutually exclusive events with positive probability each, defined on the same sample space. Find the correct answer:

   (a) A and B are necessarily independent

   (b) A and B are necessarily dependent

   (c) A and B are necessarily equally likely

   (d) None of the above

6. Let p be the probability that a coin toss turns out to be 'Heads' and let $\hat{p}$ be an estimate of this probability. A coin is tossed 20 times. The coin turns out to be 'Heads' 7 times and 'Tails' 14 times. Which of the following would you conclude?

   (a) $p = 0.3$

   (b) $p = 0.5$

   (c) The expected value of $\hat{p}$ is p

   (d) None of the above

7. A soft-drink vending machine is set so that the amount of drink dispersed is a random variable with a mean of 200 milliliters and a standard deviation of 15 millilitres. 36 samples are taken randomly from

the vending machine. The mean amount dispersed in the sample is 196 milliliters. What is the variance of the mean?

(a) 225

(b) 22.5

(c) 2.5

(d) Cannot be determined without more information

8. In 16 ten-kilometre runs, the petrol consumption of a car averaged 1 litres with a standard deviation of 0.4 litres. The t-ratio for testing the claim that the average petrol consumption (for 10 km run) of this car is 1.2 litres is

(a) 4

(b) -2

(c) 0.4

(d) -0.4

9. If $\hat{\theta}$ is an unbiased estimator of θ,then which of the following is true:

(a) $a\hat{\theta} + b$ is an unbiased estimator of $a\theta + b$ for all possible values of a and b.

(b) $a\hat{\theta} + b$ is an unbiased estimator of $a\theta + b$ only when both a and b are strictly positive

(c) $a\hat{\theta} + b$ is an unbiased estimator of $a\theta + b$ only when a is strictly positive and $b = 0$.

(d) $a\hat{\theta} + b$ is an unbiased estimator of $a\theta + b$ only when a is strictly positive and for all possible values of b.

10. If a random sample of size $n = 20$ from a normal population with the variance $\sigma^2 = 225$ has the mean 64.3, the 95% confidence interval for population mean is

(a) (44.3, 84.3)

(b) (57.7, 70.9)

(c) (49.3,79.3)

(d) None of the above

3 Mathematics

3.1 Syllabus

Topics: Elementary Set Theory and Logic; Functions; Single and Multivariable Calculus, Linear Algebra, Constrained optimization.

Recommended Textbook: "Essential Mathematics for Economic Analysis" by Sydsaeter, Hammond and Strom. Fourth Edition

3.2 Sample Questions

1. Which of the following equations has the largest number of real solutions?

   (a) $x^2 + x + 12 = 17 - 2x$

   (b) $6x + 8 = 4 - 12x$

   (c) $x^4 + x^2 + 8 = 0$

   (d) $e^x + \frac{9}{e^x} = 6$

2. If $f(x) = \begin{cases} 5x^2 & x \leq 2 \\ -3x^3 & x > 2 \end{cases}$, which of the following statements is true?

   (a) f is continuous and differentiable everywhere

(b) f is continuous and differentiable for $x > 2$

(c) f is continuous everywhere but not differentiable at $x = 2$

(d) None of the above

3. Let f be a function defined by $f(x) = e^{2x+1}$. Then $\lim_{x\to 0} \frac{f(f(x))-f(e)}{x} =$

(a) e^{2e+1}

(b) $2e^{2e+2}$

(c) $4e^{2e+2}$

(d) $8e^{2e+1}$

4. How many stationary points does the following function have: $f(x, y) = x^2 + 2x + y^2e^x$

(a) 0

(b) 1

(c) 2

(d) 3

5. The matrix A is always invertible for the following values of a and b.
$A = \begin{pmatrix} a & 0 & b \\ ab & b & a \\ a & a & b \end{pmatrix}$

(a) $a = 0; b = 1$

(b) $a \neq b$

(c) $a = 1; b = 0$

(d) None of the above

6. If $L = \lim_{x\to\infty}[(x^5 - x^4)^3 - x]$, then L equals

(a) 1/5

(b) 1/4

(c) 0

(d) None of the above

7. If $y = e^{-x-5}$, then $\frac{dx}{dy}$ equals

   (a) $-y$

   (b) $-1/y$

   (c) $-1/y^2$.

   (d) $1/5$

8. If the function $f(x, y) = x^2 + y^2$ is maximised subject to $g(x, y) = x^2 + xy + y^2 = 3$, then the following is a solution

   (a) $(1, 1)$

   (b) $(-1, -1)$

   (c) $(2, -2)$

   (d) $(3, -\sqrt{3})$

9. Let $f(x) = \frac{x^2}{x^2+2}$. Then, $-1/3\sqrt{6}$ is

   (a) A local minimum

   (b) A maximum

   (c) A global minimum

   (d) A point of inflection

10. $e^x - 1$ is

    (a) greater than $x + x^2/2$ for $x > 0$

    (b) less than $x + x^2/2$ for $x > 0$

    (c) greater than $x + x^2/2$ only for $x > 2$

    (d) greater than $x + x^2/2$ only for $x > 1$

11. If $z = e^{x^2} + y^2 e^{xy}$, $x = 2t + 3s$, $y = t^2 s^3$, then $\frac{\partial z}{\partial t}(t, s)$ at $t = 1, s = 0$ is

(a) e^4

(b) $16e^2$

(c) $8e^4$

(d) $8e^2$

4 Analytical and Logical Reasoning

4.1 Sample Questions

1. Although spinach is rich in calcium, it also contains large amounts of oxalic acid, a substance that greatly impedes calcium absorption by the body. Therefore, other calcium-containing foods must be eaten either instead of or in addition to spinach if a person is to be sure of getting enough calcium. Which of the following, if true, most seriously weakens the argument above?

   (a) Rice, which does not contain calcium, counteracts the effects of oxalic acid on calcium absorption.

   (b) Dairy products, which contain even more calcium than spinach does, are often eaten by people who eat spinach on a regular basis.

   (c) Neither the calcium nor the oxalic acid in spinach is destroyed when spinach is cooked.

   (d) Oxalic acid has little effect on the body's ability to absorb nutrients other than calcium.

2. What is the negation of the following sentence: *All Chinese citizens speak Mandarin.*

   (a) No Chinese citizen speak Mandarin.

   (b) At least one Chinese citizen speaks Mandarin.

(c) Some Chinese citizens do not speak in Mandarin.

(d) None of the above.

3. Which of the following statements are NOT equivalent to the statement: *If an animal is a primate, then it is a mammal.*

   (a) All primates are mammals.

   (b) There does not exist a primate that is not a mammal.

   (c) If an animal is not a mammal, then it is not a primate.

   (d) If an animal is not a primate, then it is not a mammal.

4. Find the missing number in the following series from the options given below

$$6, 5, 24, 25, 144, -$$

   (a) 150

   (b) 155

   (c) 175

   (d) 180

5. There are six persons A, B, C, D , E and F. C is the sister of F. B is the brother of E's husband. D is the father of A and grandfather of F. There are two fathers, three brothers and a mother in the group. Which of the following is a group of brothers ?

   (a) ABD

   (b) ABF

   (c) BFC

   (d) BDF

6. There are three persons X, Y, Z. One of them is a truth-teller (always tells the truth), another is a Liar (always lies) and the third is a normal person (sometimes lies, sometimes tells the truth). They all know of each others? and their own types.
   X said : "I am a normal person."
   Y said: "X and Z sometimes tell the truth."
   Z said : "Y is a normal person."

   Which of the following is true?

   (a) These statements are insufficient to determine who is a liar
   (b) X is a normal person, Y is a truth-teller and Z is a liar.
   (c) These statements are insufficient to determine who is a liar, or a truth-teller, or a normal person.
   (d) X is a liar, Y a normal person, Z is truth-teller.

7. The WOW language has only two letters in its alphabet, O and W. The language obeys the following rules: (i) deleting successive letters WO from any word which has more than two letters gives another word of the same meaning. (ii) inserting OW or WWOO in any place in a word yields another word of the same meaning. O, OWOOW, WOO, OWW are 4 words in this language.

   Which of the following is false?

   (a) The words WOO and OWW necessarily have the same meaning
   (b) WOO and OWW may not have the same meaning
   (c) O and OWOOW must have the same meaning
   (d) (b) and (c) are true

8. A group of medical professionals found that while 75 percent of Indian women surveyed in 1965 revealed creeping osteoporosis the figure for 2000 was 50 percent of the same population. The researchers concluded that the incidence of osteoporosis among Indians had declined between

1965 and 2000. Which of the following, if true, would most undermine the researchers' conclusion?

(a) The individuals surveyed came from a variety of income backgrounds.

(b) The individuals surveyed were all whom the medical professionals actually knew personally.

(c) The accuracy of the methods of measuring bone density has improved dramatically even in India.

(d) Those surveyed in 2000 were younger on average than those surveyed in 1965.

9. Two young persons are discussing the preservation of the species.

Meena: "Since attempting to preserve every species that is currently endangered is prohibitively expensive, the endangered species whose value to humanity is the greatest should be accorded the highest priority for preservation."

Saif: "But such a policy would be unsound because it is impossible to predict the future value of a species, nor is it always possible to assess the present value of species whose contributions to humanity, though significant, are indirect."

Which of the following is the main point of Saif's response to Meena?

(a) Since the methods for deciding which species have the most value to humanity are imperfect, informed decisions cannot be made on the basis of the assessment of such value.

(b) Although it would be desirable to preserve all endangered species, doing so is not economically feasible.

(c) Even if the value to humanity of a given species is known, that value should not be a factor in any decision on whether to expend effort to preserve that species.

(d) Species whose contributions to humanity are direct should have a higher priority for preservation efforts than species whose contributions to humanity are only indirect.