

D 72102

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Name

Reg. No.

FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2019

(CCSS)

Economics

ECO 1C 03—MATHEMATICS FOR ECONOMICS

(2018 Admissions)

Time Three Hours

Maximum : 80 Marks

Part A

Answer all questions.

Each question carries 1 mark.

Multiple Choice Questions :

1. The transpose of a rectangular matrix is a :
 - (a) Rectangular matrix.
 - (b) Diagonal matrix.
 - (c) Square matrix.
 - (d) Scalar matrix.
2. When we differentiate an expression with respect to one of a number of independent variables, we are engaged in :
 - (a) Finding definite integrals.
 - (b) Partial differentiation.
 - (c) Integration.
 - (d) Total differentiation.
3. If we roll a die the probability of any 1 of the 6 possible outcomes occurring is $1/6$. This is an example of a :
 - (a) Subjective probability.
 - (b) Classical probability.
 - (c) Conditional probability.
 - (d) Relative frequency probability.
4. $\int \frac{1}{\sqrt{x}} dx$:
 - (a) $\frac{1}{2} x^2 + c$.
 - (b) $2\sqrt{x} + c$.
 - (c) $2x^3 + c$.
 - (d) $\frac{1}{2} x + c$.

Turn over

5. Power set of empty set has exactly _____ subset.
- (a) One. (b) Two.
(c) Zero. (d) Three.
6. The probability of second event in the situation if the first event has been occurred is classified as :
- (a) Series probability. (b) Conditional probability.
(c) Joint probability. (d) Dependent probability.
7. Given $A = \{1, 3, 6, 8, 9, 12, 15\}$ and $B = \{6, 9, 12\}$, which is TRUE ?
- (a) B is the complement of A. (b) A and B are disjoint sets.
(c) $B \subset A$. (d) $A \subset B$.
8. Differentiate $f(x) = \frac{1}{2}e^{2x}$ with respect to x :
- (a) $\frac{1}{4}e^{2x}$. (b) e^x .
(c) $\frac{1}{4}e^x$. (d) e^{2x} .
9. Classify the following differential equation : $e^x \frac{dy}{dx} + 2y = x^2y$:
- (a) Separable and not linear. (b) Linear and not separable.
(c) Both separable and linear. (d) Neither separable nor linear.
10. In probability theories, the events which can never occur together are classified as :
- (a) Collectively exclusive events. (b) Mutually exhaustive events.
(c) Mutually exclusive events. (d) Collectively exhaustive events.

Part B (Very Short Answer Questions)

Answer **all** of the following.

Each question carries 2 marks.

Answer in one **or** two sentences each.

11. Explain difference of two sets with the help of an example.
12. If marginal revenue is given by $MR = 50 - 2x - 2x^2$, find the total revenue function and demand function.
13. Find the second-order direct and cross partial derivatives for the equation :

$$Z = 3x^2 + 10xy + 4y^2.$$

14. Let A and B be two events such that $P(A) = \frac{1}{5}$ While $P(A \text{ or } B) = \frac{1}{2}$. Let $P(B) = x$. For what value of x, are A and B independent ?

15. Find the Eigen values of the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & -5 & 0 \\ 1 & 8 & 1 \end{bmatrix}$.

(5 × 2 = 10 marks)

Part C (Short Answer Questions)

Answer any **eight** questions.

Each question carries 5 marks.

16. What are the properties of a determinant ?

17. Integrate a) $\int \frac{3}{(x-4)(x-1)} dx$. b) $\int x^3 \log x dx$.

18. Solve the simultaneous equations using Cramer's rule :

$$x + 2y + 3z = 1 \quad 2x + 3y + 8z = 2 \quad x + y + z = 3.$$

19. Explain the addition theorem of probability with an example.

20. What is meant by producer's surplus ? Find the producer's surplus when

$$P_d = 3q^2 - 20q + 5 \text{ and } P_s = 15 + 9q, \text{ where 'q' is the quantity.}$$

Turn over

21. Explain joint and marginal probability distributions.

22. If $A = \{1, 2, 3, 4, 5\}$, $B = \{3, 4, 5, 6, 7\}$ and $C = \{0, 1, 8, 9\}$.

Find (1) $A \cap B$; (2) $A \cup (B \cap C)$; (3) $A - B$; (4) $(A \cup B) - C$; and (5) $B \cap C$.

23. A player is to toss three coins. He wins Rs. 10 if 3 heads appear Rs. 5 if two heads appear and Rs. 1 if one head appears. He will lose Rs. 12 if no head appears. What is the expected amount?

24. From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?

25. Explain the application of partial differentiation in Economics.

26. What is random variable? What is the difference between discrete and continuous random variable?

27. Solve the difference equation $y_t = 5y_{t-1}$. Check your answer using $t = 0$ and $t = 1$. Also comment on the nature of the time path.

(8 × 5 = 40 marks)

Part D (Essay Type Questions)

Answer any two questions.
Each question carries 10 marks.

28. What is meant by rank of a matrix? Find the rank of the matrix :

$$\begin{bmatrix} 2 & 3 & 4 & -1 \\ 5 & 2 & 0 & -1 \\ -4 & 5 & 12 & -1 \end{bmatrix}.$$

29. The cost function of a firm producing two goods 'p' and 'q' is given by $C = 6p^2 + 10q^2 - pq - 30$ and the firm has a production quota of $p + q = 34$. What combination of p and q should the firm produce to minimise cost. Also estimate the effect on cost if the production quota is reduced by 1 unit.

30. (a) State and explain Baye's theorem.

(b) There are three urns containing 6 green and 4 black balls, 4 green and 6 black and 5 green and 5 black balls respectively. One urn is randomly selected and a ball is drawn from it. If the ball drawn is green, find the probability that it is drawn from the first urn.

31. Explain in detail the application of differential and integral calculus in Economics.

(2 × 10 = 20 marks)