C 32516 (Pages : 4) Name..............................

Reg. No..............................

FIRST SEMESTER M.A. DEGREE EXAMINATION, DECEMBER 2017

(CUCSS)

Economics

EC 01 C04—QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS—I

(2015 Admissions)

Time : Three Hours Maximum : 36 Weightage

Part A (Multiple Choice)

Answer all the **twelve** *questions.*
Each question carries a weightage of ¼.

1. If $\begin{pmatrix} 5 & k+2 \\ k+1 & -2 \end{pmatrix} = \begin{pmatrix} k+3 & 4 \\ 3 & -k \end{pmatrix}$, then k is :

   (a) -1. (b) -2.

   (c) 0 (d) 2.

2. For a symmetric matrix A :

   (a) $A^T A = I$. (b) $A^T = A$.

   (c) $A^2 = A$. (d) $\bar{A}^T = A$.

3. The characteristics roots of $A = \begin{pmatrix} 1 & 2 \\ 0 & 4 \end{pmatrix}$ are :

   (a) 1 and 2. (b) 1 and 4.

   (c) 0 and 2. (d) 0 and 8.

4. The transpose of the co-factor matrix is called :

   (a) Minor. (b) Inverse.

   (c) Adjoint. (d) Symmetric matrix.

5. $\lim_{x \to 0} \frac{\sin(3x)}{x}$ is :

   (a) 0. (b) 3.

   (c) 1. (d) 2.

6. The derivative of $y = 5x^4$ with respect to x is :

   (a) $20x^3$. (b) $12x^4$.

   (c) $20x^5$. (d) $4x^3$.

Turn over

7. Marginal function is :

   (a) Ratio of total function and price. (b) Product of total function and x.

   (c) Derivative of the total function. (d) Product of average function and x.

8. $\int_0^{\frac{\pi}{2}} (1 + \cos x)\, dx$ is :

   (a) $\frac{\pi}{2}$. (b) $1 + \frac{\pi}{2}$.

   (c) 1. (d) $1 - \frac{\pi}{2}$.

9. If A and B are independent events and $P(A) = 0.5, P(B) = 0.3$, then $P(A \cup B)$ is :

   (a) 0.8. (b) 0.15.

   (c) 0.7. (d) 0.65.

10. If A and B are any *two* events and $P(A) = 0.5, P(B) = 0.6, P(A \cup B) = 0.8$ then $P(A \cap B)$ is :

   (a) 0.2. (b) 0.3.

   (c) 0.4. (d) 0.6.

11. For any *two* events A and B, $P(A) - P(B)$ is :

   (a) $P(A \cap B)$. (b) $P(\overline{A} \cap B)$.

   (c) $P(A \cap \overline{B})$. (d) $P(\overline{A} \cap \overline{B})$.

12. For a continuous random variable, $P(a < x \leq b)$ is :

   (a) $F(b) - F(a)$. (b) $F(a) - F(b)$.

   (c) $F(b+h) - F(a-h)$. (d) $F(b+h) - F(a+h)$.

Part B (very Short Answer)

Answer any **five** *questions.*
Each question carries 1 *weightage.*

13. Given that $A = \begin{pmatrix} 5 & 3 & 2 \\ 4 & 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 3 & 4 \\ 1 & -1 & 2 \end{pmatrix}$. Find C such that $A + B - 2C = 0$, where 0 is a null matrix of order 2×3.

14. If $A = \begin{pmatrix} 1 & 2 & 0 \\ 3 & -4 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -7 \\ 5 & 8 \\ 2 & 1 \end{pmatrix}$. Show that $(AB)^T = B^T \cdot A^T$.

15. For the cost function $c(x) = 3x^2 + 2x$, find the marginal cost for an output of 4 units.

16. If $y = 2x^2 + \cos x$, then find $\frac{d^2y}{dx^2}$.

17. Evaluate $\int_0^x 4e^{-4x}\,dx$.

18. State the addition theorem for two events A and B.

19. In the process of manufacture of part, A, 10 out of 100 are likely to he defective. Similarly, 6 out of 100 are likely to be defective in the manufacture of part B. Calculate the probability that the assembled part will be defective.

20. State Baye's theorem.

Part C (Short Answer)

Answer any **eight** *questions.*
Each question carries 2 weightage.

21. Given $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 4 & 5 & 4 \end{pmatrix}$. Show that A is non-singular.

22. Obtain the equilibrium prices of the following market model :

$$qd_1 = 12 + p_1 - 2p_2 \qquad qs_1 = -2 + 3p_2$$
$$qd_2 = 18 - 3p_1 + p_2 \qquad qs_2 = -2 + 4p_1$$

23. Find characteristics roots of $\begin{pmatrix} 9 & 0 & 0 \\ 2 & 5 & 0 \\ 5 & 7 & 1 \end{pmatrix}$.

24. Find the maxima and minima of the function $f(x) = (x-2)^2(x+3)$.

25. Find the slope of the function $2x^3 + 6x^2 + 6$ at $x = -2$ and at $x = 3$.

26. Find the partial derivatives $\frac{\partial^2 y}{\partial x^2}$ and $\frac{\partial^2 x}{\partial x\,\partial y}$ of the function $2x^4 - 4y^3 + 2y^2 - 8xy + 9$.

27. Explain the Lagrangian method of multipliers in optimization ?

28. If two dice are thrown, what is the probability that the sum is (a) greater than 8, and (b) neither 7 nor 11.

29. A bag contains 6 white balls. 4 red balls and 8 blue balls. Two ball aredrawn at random. Find the probability that they are (i)white and blue, (ii) both are red, and (iii) both are blue.

30. If A, B and C are independent events show that $A \cup B$ and C are also independent.

31. The probability that there is at least one error in an accounts statement prepared by A is 0.4 and for B and Cthey are 0.3 and 0.6 respectively. A, B and C prepared 10, 16 and 20 statements respectively. Find the expected number of correct statements in all.

Part D (Essay)

Answer any **three** *questions.*
Each question carries 4 weightage.

32. Solve the following system of equations with the help of matrices

$x + 2y + 3z = 14$; $3x + 2z = 11 - y$; $2x + 3y = 11 - z$.

33. If p_t be the price, x_t the per capita quantity, y_t the per capita disposable income at time t and the demand function is :

$$\log p_t = 0.768 + 4 \log x_t - 21 \log y_t ,$$

Compute the price elasticity and income elasticity of demand.

34. In a bolt manufacturing factory machines A, B and C manufactures respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 percents arc defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B and C ?

35. (a) Two ideal dice are thrown. Let X_1 be the score on the first die and X_2 denote the score on the second die. Let Y denote the maximum of X_1 and X_2 :

(i) Write down the joint distribution of Y and X_1.

(ii) Find the mean and variance of Y.

(b) Let X be a random variable with the following probability distribution :

x	:	-3	6	9
P (X = x)	:	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

Find E (X), E (X^2) and V (X).

36. A random variable X assumes the values $-5, -3, -1, 0, 1, 3, 5$ such that $P(X=-5) = P(X=-3) = P(X=-1)$, $P(X=1) = P(X=3) = P(X=5)$ and $2P(X=0) = P(X>0) = P(X<0)$. Obtain the probability mass function of X and distribution function of X.