D 13382 **(Pages : 6)** Name..................................

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

FIRST SEMESTER M.A. DEGREE EXAMINATION, DECEMBER 2016

(CUCSS)

Economics

ECO 1C 04—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 $A = \begin{bmatrix} 3 & 4x \\ -1 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 8 \\ -1 & 3x \end{bmatrix}$ and A = B then x is :

    (a) 6. (b) 3.

    (c) 2. (d) –1.

2. For an orthogonal matrix A :

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

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

3. The signed minor is called :

    (a) Inverse. (b) Co-factor.

    (c) Orthogonal. (d) Adjoint.

4. For an idempotent matrix A :

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

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

5. $\lim_{x \to 3} \dfrac{x^2 - 9}{x - 3}$ is :

    (a) 0. (b) 3.

    (c) 6. (d) 9.

Turn over

6. If $y = 2x^4 + \cos x$, then $\frac{d^2y}{dx^2}$ is :

(a) $24x^2 - \frac{\cos x}{x}$. (b) $24x^2 - \cos x$.

(c) $24x^2 - \sin x$. (d) $4x + \cos x$.

7. $\int_0^\infty e^{-2x}\, dx$ is :

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

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

8. If A and B are mutually exclusive events, then $P(A \cup B)$ is :

(a) $P(A) + P(B) - P(A \cap B)$. (b) $P(A) + P(B)$.

(c) $P(A) + P(B) - P(A) \cdot P(B)$. (d) $P(A) \cdot P(B/A)$.

9. If A and B are any two events and $P(A) = 0.5$, $P(B) = 0.6$, $P(A \cap B) = 0.3$ then $P(A \cup B)$ is :

(a) 0.2. (b) 0.4.

(c) 0.8. (d) 0.65.

10. For any *two* independent events A and B, $P(A \cap B)$ is :

(a) $P(A) + P(B)$. (b) $P(B) - P(AB)$.

(c) $P(A) \cdot P(B)$. (d) $P(A) - P(AB)$.

11. If A and B are two dependent events then $P(A/B)$ is :

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

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

12. If X is a discrete random variable, and $F(x)$ is the cumulative density function, then the probability mass function $p(x)$ is :

(a) $F(x+1) - F(x)$. (b) $F(x) - F(x-1)$.

(c) $F(x) - F(x+1)$. (d) $F(x+1) - F(x-1)$.

($12 \times \frac{1}{4} = 3$ weightage)

Part B (Very Short Answers)

Answer any **five** *questions.*

Each question carries 1 *weightage.*

13. If $A = \begin{pmatrix} 1 & 2 \\ 3 & -4 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -7 \\ 5 & 8 \end{pmatrix}$ and $C = \begin{pmatrix} 1 & 5 \\ 0 & 2 \end{pmatrix}$ then find A + 2B – C.

14. Find the co-factors of 2 and 3 in $\begin{pmatrix} 2 & 1 & 5 \\ 3 & 4 & 2 \\ 6 & 8 & 4 \end{pmatrix}$.

15. For the cost function $c(x) = 1 + 2x + 3x^2$, find the marginal cost of producing 10 units.

16. If $y = 2x^3 + \log x$, then find $\dfrac{d^2y}{dx^2}$.

17. Differentiate $\dfrac{(5x-2)^2}{x-3}$ with respect to x and hence find the stationary points.

18. Evaluate $\int_0^{\infty} 6e^{-3x}\, dx$.

19. Define the terms random experiment and sample space.

20. Find the probability of drawing any *one* spade card from a pack of cards.

(5 × 1 = 5 weightage)

Part C (Short Answers)

Answer any **eight** *questions.*

Each question carries 2 *weightage.*

21. Find the rank of the matrix $\begin{pmatrix} 3 & 1 & 4 & 2 \\ 1 & 2 & 3 & -1 \\ 2 & 1 & 6 & 2 \end{pmatrix}$.

22. Find A^{-1}, if $A = \begin{bmatrix} 9 & 7 & 3 \\ 5 & -1 & 4 \\ 3 & 4 & 1 \end{bmatrix}$.

23. Find characteristic roots of $\begin{pmatrix} 2 & 1 & 5 \\ 0 & 3 & 1 \\ 0 & 0 & 4 \end{pmatrix}$.

24. Find the maxima and minima of the total cost function

$$TC = 31 + 24Q - 5,5Q^2 + \frac{1}{3}Q^3.$$

25. Find the slope of the function $x^3 - 14x^2 + 24 = 0$ at $x = 2$ and at $x = -3$.

26. Find the partial derivatives $\frac{\partial^2 y}{\partial x^2}$ and $\frac{\partial^2 x}{\partial y^2}$ of the function $3x^4 - 6y^4 + 10xy + 5$.

27. Explain about constraint optimization methods ?

28. A problem in Statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved ?

29. Explain Baye's theorem on conditional probability and give its uses.

30. If the p.m.f. of a random variable X is :

$$p(x) = \frac{x}{15} \quad , \quad x = 1, 2, 3, 4, 5$$
$$= 0 \quad , \quad \text{otherwise}$$

Find (i) $P\{X = \text{multiple of } 2 \text{ or } 4\}$; (ii) $P\left\{\frac{3}{2} < X < \frac{9}{2}\right\}$; and (iii) $P\left\{\frac{3}{2} < X < \frac{9}{2} \mid X > 3\right\}$.

31. Define mathematical expectation. The probability that a man fishing at a particular place will catch 1, 2, 3, 4 fish are 0.4, 0.3, 0.2 and 0.1 respectively. What is the expected number of fishes caught ?

(8 × 2 = 16 weightage)

Part D (Essays)

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

32. The demand and supply functions of three commodities X, Y, Z are given as :

$$d_x = 23 - 5p_x + 3p_y - 3p_z \quad ; \quad S_x = 3 + p_x.$$

$$d_y = 12 + 3p_x + 6p_y + 3p_z \quad ; \quad S_x = 15 + 6p_y.$$

$$d_z = 64 - 3p_x - 3p_y - 9p_z \quad ; \quad S_x = 10 + 6p_z.$$

Obtain the equilibrium prices and quantities.

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 :

$\log p_i = 0.618 - 2.27 \log x_i + 1.31 \log y_i$.

Compute the price elasticity and income elasticity of demand.

34. In a bolt manufacturing factory machines A, B and C manufactures respectively 50%, 30% and 20% of the total. Of their output 4, 5, 2 percents are 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 ?

Turn over

35. A bag contains 30 balls numbered from 1 to 30. One ball is drawn at random. Find the probability that the number on the ball drawn will be a multiple of (i) 5 or 6, (ii) 3 or 4, (iii) 5 and 3. A reward of Rs. 100 is given if the number on the selected ball is a multiple of 5 or 6 and reward of Rs. 150 and Rs. 200 are given if the selected number is a multiple of 3 or 4, 5 and 3 respectively. Find the expected reward obtained.

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

$(3 \times 4 = 12$ weightage)