FIRST SEMESTER M.A. DEGREE EXAMINATION, NOVEMBER 2024

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19P ECO1 C04 - QUANTITATIVE METHODS FOR ECONOMIC ANALYSIS - I

(Economics)

(2019 Admission onwards)

Time : 3 Hours   Maximum : 30 Weightage

Part A

Answer *all* questions. Each question carries 1/5 weightage.

1. A negatively sloped curve moves:
   (a) Upward   (b) Downward   (c) Vertically   (d) Horizontally

2. A square matrix A is said to be orthogonal if:
   (a) $AA^T = 0 = A^T A$ (b) $AA^T = I = A^T A$
   (c) $AA^T = -I = A^T A$ (d) None of these

3. The value of the determinant $\begin{vmatrix} a - b & a + b \\ a + b & a - b \end{vmatrix}$ is:
   (a) $-4ab$ (b) $4ab$ (c) $a^2 - b^2$ (d) None of these

4. Solve $4 = \frac{2}{3}x$:
   (a) $\frac{8}{3}$ (b) 6   (c) $\frac{1}{6}$ (d) None of these.

5. The rank of the matrix $\begin{pmatrix} 3 & 2 \\ 6 & 4 \end{pmatrix}$ is:
   (a) 0   (b) 1   (c) 2   (d) None of these

6. $\lim_{x \to 0} \cos x$ is:
   (a) 0   (b) 1   (c) sin x   (d) None of these

7. The slope of the supply function S = 2 + 4P is:
   (a) 0   (b) 2   (c) 4   (d) 7

8. The demand for a commodity is D= 44-7p. The supply function is S = 2p-10, then the equilibrium price is:
   (a) 2   (b) 6   (c) 4   (d) 8

9. The point of intersection of demand and supply curves is known as:
   (a) Break-even point   (b) Equlibrium point   (c) Isoquants   (d) None of these

10. If $u = e^{3xyz}$, then $\frac{\partial u}{\partial z}$ at x = 1, y = 1 is:
    (a) $3e^{3z}$ (b) $3e^{3z}$ (c) e^{3z} (d) $3e^{3xyz}$

11. Which of the following approximates the marginal impact on the objective function caused by a small change in the constant of the constraint:

(a) the Legrange multiplier (b) the Jacobian

(c) the Hessian (d) the determinant

12. The producers surplus when the supply function is p = 10+2q and the equilibrium price 20 is:

(a) 35 (b) 25 (c) 100 (d) 50

13. The degree of the differential equation $\left(\dfrac{d^3y}{dx^3}\right)^2 + \dfrac{d^2y}{dx^2} - 6y = 0$ is:

(a) First (b) Second (c) Third (d) None of these

14. The solution of the differential equation $(x^2 + 1)\dfrac{dy}{dx} + (y^2 + 1) = 0$ is:

(a) $y = 2 + x^2$ (b) $y = \dfrac{1 + x}{1 - x}$ (c) $y = \dfrac{1 - x}{1 + x}$ (d) $y = x(x - 1)$

15. At the rate of 8.5% p.a. simple interest, a sum of Rs.4800 will earn how much interest in 2 years 3 months.

(a) 796 (b) 816 (c) 918 (d) 956

(15 × 1/5 = 3 Weightage)

Part B (Very Short Answer Questions)

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

16. Define exponential function.

17. State limit of a function.

18. Given $Q = 700 - 2P + 0.02y$, where $p = 25$ and $y = 5000$. Find the price elasticity of demand.

19. The cost of producing xx units of a product is given by $C(x) = 600 + 90x - 90\,log(x), x \geq 1$. Find the minimum average cost.

20. Find the total revenue function given $MR = 34 - 5Q - 7Q^2$.

21. (i) Write down general formula for first order linear difference equation.
    (ii) Solve : $y_{t+1} + 3y_t = 2$ and $y_0 = 10$.

22. The salary of employee increases every year by 7% of his initial salary and his initial basic salary is Rs.5000. Find his salary at the end of 10th year.

23. Define sinking fund.

(5 × 1 = 5 Weightage)

Part C (Short Answer Questions)

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

24. Show that $\begin{vmatrix} 0 & ab^2 & ac^2 \\ a^2b & 0 & bc^2 \\ a^2c & b^2c & 0 \end{vmatrix} = 2a^3b^3c^3$.

25. Obtain the inverse of matrix $\begin{bmatrix} 1 & -2 & 3 \\ 3 & -1 & 4 \\ 2 & 1 & -2 \end{bmatrix}$

26. Solve the system of equations by Crammer's rule.

    $2x - 3y + 5z = 11,\ 5x + 2y - 7z = -12,\ -4x + 3y + z = 5.$

27. Define rank of a matrix. Find the rank of the matrix $\begin{pmatrix} 2 & 3 & 1 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{pmatrix}$.

28. The demand function faced by a firm is $p = 500 - 0.2x$ and its cost function is $C = 25x + 10000$ (p=price, x=output, C=cost). Find the output at which the profits of the firm are maximum. Also find the price it will charge.

29. Write short notes on: (i) Marginal Cost. (ii) Marginal Revenue (iii) Averagecost (iv) Average Revenue.

30. Given: $Z = x^4 e^{3y}$. Find all partial derivatives of second order.

31. Demand and Supply laws under pure competition are given by $p_d = 16 - x^2$ and $p_s = 4 + x$. Determine consumer's surplus.

32. What is first order linear differential equation and then solve $2\dfrac{dy}{dx} - 8y = 16;\ y(0) = 0.$

33. Find the amount at the end of 7 th year for Rs. 5000 at 10% p.a., simple interest. What is the total amount of growth?

(7 × 2 = 14 Weightage)

Part D (Essay questions)

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

34. Find the adjoint of the matrix and verify that $A(AdjA) = |A|I$ if $A = \begin{pmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{pmatrix}$.

35. A firm has the following total revenue and total cost functions.

    $TR = 100x - x^2,\ TC = x^3 - \dfrac{57}{2}x^2$ where x is level of output. Find maximum profit.

36. The cost of producing 'y' tons of steel is given by $C(Y) = y^3 + 2y^2 - 6y + 4$ Obtain the following.
    (i) Slope of marginal cost at y = 6. (ii) Average cost. (iii) Average variable cost. (iv) The value of 'y' for which marginal cost is same as average variable cost.

37. (i) Write down differential equations of the type limited and unlimited growth.
    (ii) The rate at which the volume of sales(Q) for a new type of printer increase after an advertising campaign is given by the equation $\dfrac{dQ}{dt} = 0.04(700 - Q)$, given that Q=0 at t=0. Q is the number of printers sold, t is the time in years. Solve the differential equation to obtain an expression for Q in terms of t.

(2 × 4 = 8 Weightage)

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