Subject: DE 455-Mathematical Methods in Economics II   FM: 60

Level/program: Bachelor (B.A)   Semester: V   Time: 3 Hours   PM: 30

Candidates are required to answer the questions in their own words as far as practicable.

Attempt ALL of the following Very Short Answer Questions.   **10x1=10**

1. How can you define first order and degree differential equation?
2. If P = (1, 2, 1), Q = (2, 1, 2) and R = (-2, 3, -2).
    Very that: P.(Q+R) = P. Q+P.R
3. If X = (2, 3, -2) and Y = (1, 0, 1). Find $\|X - Y\|$?
4. How can you define angle between two vectors?
5. Define linear Transformation.
6. What is Eigen value of the matrix?
7. Find the determinant of the matrix $A = \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$.
8. Find the second order derivative of: $y = 3x^2$
9. What is stationary point?
10. What is condition of maxima at two variables?

Attempt any THREE of the Following Short Questions.   **3x8 =24**

11. Define homogeneous equations. Solve: $x^2 \frac{dy}{dx} + y^2 = xy$.

12. Define the scalar and vector projection Q onto P. Find the scalar and vector projection Q onto P, if Q = (1, 2, 3) and P = (4, -1, 3).

13. If the revenue function and the total cost function of a firm are $R(x) = 14x - x^2$ and $C(x) = x^3 - 2x$ respectively. Find the level of output x in order to maximize the profit. Also, find the maximum profit.

14. Define Euler's theorem on homogeneous function. Verify Euler's theorem for the function $u(x, y) = x^3 + 2x^2y + y^3$.

Attempt any TWO of the Following Long Questions.   **2x13 =26**

16. i. Find a vector which is orthogonal to P = (0, 1, 0) with respect to vector Q = (1, 0, 0) and normalized it.

ii. Let $T: R^2 \to R^2$ be a linear transformation for which T(1,1)= 3, T(0,1) = 2 then, find the value of T(1,0).

17. How can you define the integral curve? The demand and the supply functions under pure competition are $D(x) = 20 - 2x - x^2$ and $S(x) = x^2 + 8$ respectively.
    i. Calculate the equilibrium price and quantity.
    ii. Calculate the consumer and producer surplus at the equilibrium point.
    iii. Also, calculate the total surplus.

18. Examine the function for maximum or minimum
    $f(x, y) = x^2 + y^2 + xy + 10x + 10y$.
    Find also the extreme values.

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