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Reg. No. : ....

Name : ....

Second Semester B.A. Degree Examination, September 2022

First Degree Programme under CBCSS

Mathematics

Complementary Course for Economics

MM 1231.5 : MATHEMATICS FOR ECONOMICS II

(2013 – 2019 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – I

All the first **ten** questions are compulsory. They carry **1** mark each.

1. Write the derivative of $\log x$.

2. State product rule of differentiation.

3. Find $\frac{d}{dx}(x^3 + x^2 + x + 1)$.

4. What is the geometrical meaning of derivative of a function at a point?

5. If total cost is $TC = 5x^2 + 15$, what is the marginal cost function MC?

6. State product rule of partial differentiation to find $\frac{\partial z}{\partial y}$, where $z = g(x, y).h(x, y)$.

7. Define saddle point.

P.T.O.

8. What is a critical point?

9. Find the second derivative of $y = \sin x$.

10. Is $x^2 + y^2 = 1$ homogeneous?

(10 × 1 = 10 Marks)

SECTION – II

Answer any **eight** questions. These questions carry **2** marks each.

11. If the linear demand function $Q = -\frac{1}{3}P + 235$, find the total revenue function for the producer.

12. If total cost function $TC = 2Q^2 + 3Q + 52$ and total revenue function $TR = -Q^2 + 55Q$, find the marginal cost and marginal revenue.

13. Show that the marginal revenue can be expressed as $p + x\frac{dp}{dx}$.

14. Find the derivative of $y = \frac{x^2 + 1}{x^3}$.

15. Find the critical points of $f(x) = 3x^3 - 27x^2 + 45x + 28$.

16. Find $\frac{dy}{dx}$ where $x = \cos t$ and $y = \sin t$.

17. If x and y satisfy the equation $x^2 + y^2 = 1$, prove that $\frac{dy}{dx} = -\frac{x}{y}$.

18. Differentiate $y = x.\log(x^2 + 1)$.

19. Find $\frac{dP}{dQ}$, where $Q = 94 - 3P$.

20. Find the conditions for a function $f(x, y)$ to have relative maximum.

21. Find z_x at the point $x = 1, y = 2$ where $z = 2x^3y^4$.

22. Find dy/dx where $7x^6 + 4y^5 - 96 = 0$.

(8 × 2 = 16 Marks)

SECTION – III

Answer any **six** questions. These questions carry **4** marks each.

23. Find equilibrium price and equilibrium quantity given supply : $Q = \frac{2}{3}P + 150$ and Demand : $Q = -\frac{1}{3}P + 450$, using (a) equations (b) graphs.

24. If total cost and total revenue functions are $TC = Q^3 - 1.5Q^2 + 50Q + 425$ and $TR = 3200Q - 9Q^2$, find maximum profit.

25. Find $f'(x)$, $f''(x)$, $f'''(x)$ and $f^{(4)}(x)$, where $f(x) = x^4 - 5x^3 + 11x + 3$.

26. Given $z = \frac{14x}{9x - 4y}$, find the partial derivatives z_x and z_y.

27. Given $z = 4x^5 + 7xy + 8y^4$, find z_{xx} and z_{yy}.

28. If $x = r\cos t$, $y = r\sin t$, find the second order derivative of x and y with respect to t.

29. Show that the demand curve $p = \frac{a}{x + b} - c$ is downward sloping and convex from below.

30. Write a short note on geometrical interpretation of partial derivatives.

31. Give any two applications of derivatives in business and economics.

(6 × 4 = 24 Marks)

SECTION – IV

Answer any **two** questions. These questions carry **15** marks each.

32. Given that total revenue $R(x) = 280x - 2x^2$ and total cost $C(x) = 60x + 5600$.

    (a) Express profit as a function of x.

    (b) Determine maximum level of profit.

    (c) Sketch the graph of profit function

33. Differentiate the following equations

    (a) $\dfrac{\sin x . \cos x}{x}$

    (b) $\sqrt{\dfrac{3+x}{2-x}}$

    (c) $x^2 + y^2 + 2x + 4y + 5 = 0$.

34. Find the critical points and test to see if the function is at relative maximum or minimum given $z = 3x^3 + 2y^3 + 9x^2 - 12y^2 - 72x - 126y + 19$.

35. Optimize $f(x, y) = 120x - 2x^2 - xy - 3y^2 + 160y + 7$ subject to $3x + y = 480$.

(2 × 15 = 30 Marks)