

E 6533



00006533



Reg. No.....

Name.....

B.A. DEGREE (C.B.C.S.S.) EXAMINATION, SEPTEMBER 2024

First Semester

Complementary Course—Economics

MATHEMATICAL ECONOMICS

[2013—2016 Admissions]

Time : Three Hours

Maximum Marks : 80

Part A

*Answer **all** questions.*

Each question carries 1 mark.

1. What is the slope of the line $2x + 3y = 2$.

2. Solve the equation $\frac{x}{4} - 2 = \frac{x}{5} + 1$.

3. Find the derivative of :

$$x^3 - \frac{2}{x^2} + 1.$$

4. How will you define the elasticity of demand.

5. Find the derivative of $\log_a x^3$.

6. What do you mean by cardinal utility ?

7. Find $\int (2x + 1) dx$.

8. Is the function $f(x, y) = x^2y - xy^2$ homogeneous.

9. What is a budget line ?

Turn over





E 6533

10. Given that $f(x, y) = 2x + 3y^2 + x - y$, Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$.

(10 × 1 = 10)

Part B

*Answer any **eight** questions.*

Each question carries 2 marks.

11. Write the transpose of the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ -2 & 1 & 2 \\ 3 & -1 & -3 \end{bmatrix}$.

12. Given $A = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 0 \\ 1 & 1 \end{bmatrix}$ find $A - B$.

13. Solve the equation $x^2 + x - 6 = 0$.

14. Find $\int e^{2x+3} dx$.

15. Find the derivative of $a^{x^2} + x$.

16. Given $q = 30 - 4p - p^2$, Find the elasticity of demand for $p = 3$.

17. Given $u = 4x^2 + 3y^2$. Find the differential du .

18. If $A = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 1 & 2 \\ 2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ 1 & 1 \\ 5 & 1 \end{bmatrix}$, Find AB .

19. State Euler's theorem.

20. Explain income effect and substitution effect.





E 6533

21. Given $u(x, y) = x^2y + xy^2 + 2xy$, find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.

22. What are points of inflection ?

(8 × 2 = 16)

Part C

Answer any **six** questions.

Each question carries 4 marks.

23. Draw the graph of $y = 2x - 2$.

24. Find the equilibrium price and quantity for the market.

$$Q_s + 32 - 7p = 0$$

$$Q_d - 128 + 9p = 0.$$

25. Use quotient rule to find the derivative of $y = \frac{15x^2}{2x^2 + 7x - 3}$.

26. Use implicit differentiation to find the derivative of $4x^2 - y^3 = 97$.

27. Optimize $f(x) = 2x^3 - 30x^2 + 126x + 59$.

28. Find the marginal and average function for the total function $TR = 12Q - Q^2$ and evaluate them at $Q = 3$ and $Q = 5$.

29. Given $z = \frac{(x - y)}{(x + 1)}$. Find the total differential dz .

30. Find the determinant of the matrix :

$$A = \begin{bmatrix} 5 & -9 & 3 \\ 2 & 12 & -4 \\ -3 & -18 & 6 \end{bmatrix}.$$

Turn over





E 6533

31. Find $\int \frac{x^2}{(4x^3 + 7)^2} dx$.

(6 × 4 = 24)

Part D

Answer any **two** questions.

Each question carries 15 marks.

32. (a) Use matrix inversion to solve the system of equations :

$$2x_1 + 4x_2 - 3x_3 = 12$$

$$3x_1 - 5x_2 + 2x_3 = 13$$

$$-x_1 + 3x_2 + 2x_3 = 17.$$

- (b) Use Cramer's rule to solve :

$$18p_b - p_p = 87$$

$$-2p_b + 36p_p = 98.$$

33. (a) Maximize profits π for a firm, given total revenue $R = 4000Q - 33Q^2$ and total cost $C = 2Q^3 - 3Q^2 + 400Q + 5000$, assuming $Q > 0$.

- (b) Test whether $y = x^3 - 7x^2 + 6x - 2$ increasing, decreasing or stationary at $x = 4$.

34. (a) Verify Euler's theorem for the function $f(x, y) = x^3 + 2x^2y + y^3$.

- (b) Find the integral for $y = \int \left(2x^5 - 3x^{-\frac{1}{4}} \right) dx$, given the initial condition $y = 6$, when $x = 0$.

- (c) Use integration by parts to evaluate $\int x^4 (2x^5 - 5)^4 dx$.

35. (a) Discuss the uses of calculus in Economics.

- (b) Solve the differential equation :

$$\frac{dy}{dx} + 5y = 0.$$

$$\int x^4 (2x^5 - 5)^4 dx.$$

(2 × 15 = 30)

