

QUESTION BANK
DEPARTMENT OF ECONOMICS, NAYAGARH AUTONOMOUS
COLLEGE, NAYAGARH

+3 1st YEAR ARTS (1st SEMESTER)
CORE-04
MATHEMATICAL METHOD FOR ECONOMICS-II
GROUP-A

1. The input output model was developed by _____.
2. _____ Shows the numbers of units any industry's output needed to produce one unit of another industry's output.
3. The input coefficient matrix is also called _____ matrix.
4. _____ Condition used to test the feasibility of an input output model.
5. In case of input output model the $[I-A]$ matrix is known as _____.
6. For the feasibility of input output model, the determinant of $[I-A]$ matrix must be _____.
7. For the feasibility of input output model, the diagonal elements of $[I-A]$ matrix must be _____.
8. In _____ model the entire production is consumed internally.
9. In _____ model there is absence of final demand sector.
10. The second order derivative of $Y=4x^2$ is _____.
11. The second order derivative of $y=\frac{1}{3x^2}$ is _____.
12. The second order derivative of $y=5x^3+3x^2+34$ is _____.
13. The second order derivative of $y=e^{2x}$ is _____.
14. If the 1st order derivative is greater than zero, then the function is called _____ function.
15. If the 1st order derivative is less than zero, then the function is called _____ function.
16. A function is _____ at $x=a$ if in an area very close to $[a, f(a)]$ the graph of the function lies completely above its tangent line.
17. A function is _____ at $x=a$ if in an area very close to $[a, f(a)]$ the graph of the function lies completely below its tangent line.
18. A positive second order derivative at $x=a$ denotes the function is _____ at a .
19. A negative second order derivative at $x=a$ denotes the function is _____ at a .
20. A _____ is a point at which the function is either at a relative maximum or minimum.
21. _____ is a point on the graph where the function crosses its tangent line and changes from convex to concave or vice versa.
22. _____ occurs only where the second order derivative is zero.
23. At the point of inflexion value of second order derivative is _____.
24. _____ is the process of finding the relative maximum or minimum of a function.

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25. The $\frac{dy}{dx}$ of $2x - 3y = 6$ is _____.
26. The $\frac{dy}{dx}$ of $x^2 + 2y = 23$ is _____.
27. The $\frac{dy}{dx}$ of $3x^2 + 4y = 65$ is _____.
28. The total differential of $y = 4x^3 + 7x^2 - 3x + 3$ is _____.
29. The total differential of $y = 7x^2 + 4x - 45$ is _____.
30. The total differential of $y = 4x^2 3x$ is _____.
31. The total differential of $y = \frac{2x-3}{3x}$ is _____.
32. The necessary condition for maximisation is $f'(a) =$ _____.
33. The necessary condition for minimisation is $f'(a) =$ _____.
34. The sufficiency condition for maximisation is $f'(a) =$ _____.
35. The sufficiency condition for minimisation is $f'(a) =$ _____.
36. The critical value of the function $y = 7x^2 + 112x - 54$ is _____.
37. The critical value of the function $y = -9x^2 + 72x - 13$ is _____.
38. The critical value of the function $y = -7x^2 + 126x - 23$ is _____.
39. For the maximization of a multi variable function $f_{xx} \cdot f_{yy}$ must be _____.
40. For the minimization of a multi variable function $f_{xx} \cdot f_{yy}$ must be _____.
41. In case of multivariable optimization if $f_{xx} \cdot f_{yy} < f_{xx}^2$ and f_{xx} and f_{yy} have the same signs, the function is at _____ point.
42. In case of multivariable optimization if $f_{xx} \cdot f_{yy} < f_{xx}^2$ and f_{xx} and f_{yy} have the different signs, the function is at _____ Point.
43. The integral value of $\int 3.5 dx$ is _____.
44. The integral value of $\int \frac{1}{2} dx$ is _____.
45. The integral value of $\int dx$ is _____.
46. The integral value of $\int 5x^2 dx$ is _____.
47. The integral value of $\int 8^x dx$ is _____.
48. The integral value of $\int_1^4 10x \cdot dx$ is _____.
49. Reversing the limit changes the _____ of the definite integral.
50. If the upper limit of the integration equals the lower limit of the integration, the value of the definite integral is _____.
51. If marginal revenue is $100 - 2 - 3q^2$ then total revenue will be _____.
52. If marginal revenue is $84 - 4q - q^2$ then total revenue will be _____.
53. If marginal cost is $25 + 30q - q^2$ then total variable cost will be _____.
54. If marginal cost is $45 + 10q - 92$ then total variable cost will be _____.

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55. If all the principal minors are negative, the bordered Hessian is _____ definite.
56. A positive definite Hessian always satisfies the sufficient condition of a relative _____.
57. If the principal minors alternate consistently in sign from positive to negative, the bordered Hessian is _____ definite.
58. A negative definite Hessian always meets the sufficient condition for a relative _____.

GROUP-B

Each question carries 2 marks

1. Define closed input output model?
2. Define open input output model?
3. What is static input output model?
4. What is dynamic input output model?
5. What is transaction matrix?
6. What is a technological coefficient?
7. What is technological coefficient matrix?
8. What is input vector?
9. State the feasibility conditions of input output model?
10. Find the second order derivative of $y = 3x^4 - 2x^3 + 6x$.
11. Find the second order derivative of $y = \log x$.
13. Find the second order derivative of $y = \log(x + a)$
14. What is increasing function?
15. What is decreasing function?
16. What is concavity of a function?
17. What is convexity of a function?
18. What is point of inflection?
19. State the condition for convexity of a function?
20. State the condition for concavity of a function?
21. State the condition for point of inflection?
22. Define total differential?
23. Find the total differential of the function $y = 7x^3 - 5x^2 + 6x - 3$.
24. Find the total differential of the function $y = (4x + 3)(3x - 8)$.
25. Find the total differential of the function $z = 7x^2y^3$
26. Find the total differential of the function $z = \frac{9y^3}{x-y}$
27. Find the total differential of the function $z = (x - 3y)^3$
28. Find the total differential of the function $z = x^2 + 2xy$.
29. Find the total differential of the function $z = x^y$.
30. Find the total derivative dz/dx for $z = 6x^2 + 15xy + 3y^2$ where $y = 7x^2$
31. Find the total derivative dz/dx for $Z = (13x - 18y)^2$ where $y = 3x - 4$.
32. What is implicit function?
33. Find derivative dy/dx of the implicit function $4x^2 - y^3 = 76$.
34. Find derivative dy/dx of the implicit function $24x^3 + 4y^2 = 564$.
35. Find derivative dy/dx of the implicit function $7x^2y^3 = 67$

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36. Find derivative dy/dx of the implicit function $x^2 - 2xy = 76$
37. What is stationary function?
38. State the condition for increasing function?
39. State the condition for decreasing function?
40. Define maxima of a function?
41. Define minima of a function?
42. State the condition for relative maxima?
43. State the condition for relative minima?
44. Test whether the function is increasing or decreasing or stationary at $x=4$, $y=3x^2 - 14x + 5$.
45. Test whether the function is increasing or decreasing or stationary at $x=4$, $y=x^3 - 7x^2 + 6x - 2$.
46. Test whether the function is increasing or decreasing or stationary at $x=4$, $y=x^4 - 6x^3 + 4x^2 - 13$.
47. Test to see if the following function is concave or convex at $x=3$, $y=-2x^2 + 4x^2 + 9x - 15$.
48. Test to see if the following function is concave or convex at $x=3$, $y=(5x^2 - 8)^2$.
49. Find the critical value of the function $f(x) = -7x^2 + 126x - 23$.
50. Find the critical value of the function $f(x) = 3x^3 - 36x^2 + 135x - 13$
51. Find the critical value of the function $f(x) = 2x^4 - 16x^3 + 32x^2 + 5$.
52. State the condition for relative maximum in case of multi variable function?
53. State the condition for relative minimum in case of multi variable function?
54. What is convex set?
55. What is convex function?
56. What is integration?
57. Determine the integral $\int 4x^3 dx$.
58. Determine the integral $\int x^{\frac{2}{3}} dx$.
59. Determine the integral $\int x^{-\frac{5}{2}} dx$.
60. Determine the integral $\int \frac{1}{3x} dx$.
61. Determine the integral $\int (5x^3 + 2x^2 + 3x) dx$.
62. Determine the integral by using the substitution method $\int 10x(x^2 + 3)^4 dx$.
63. Determine the integral by using the by parts method $\int \frac{2x}{(8-x)^3} dx$.
64. Evaluate the definite integral $\int_1^{10} 3x^2 dx$.
65. Evaluate the definite integral $\int_1^{64} x^{-\frac{2}{3}} dx$.
66. What is constraint optimization?
67. State the necessary condition for constraint maxima?
68. State the necessary condition for constraint minima?
69. What is Lagrange multiplier?
70. What is Lagrange function?
71. How to interpret Lagrange multiplier in case of constraint optimization.

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GROUP-C

1. State the main features of input output model?
2. State the assumptions of input output model?
3. What is input coefficient matrix?
4. What is Hawkins Simon conditions?
5. What is Leontief matrix?
6. Find the second order derivative of $y=x^3 \log x$.
7. Find the second order derivative of $y=(2x+3)^{10}$
8. Find the second order derivative of $y=x^2 + \sqrt{x}$
9. Find the total differential of the function $y=\frac{9x-4}{5x}$
10. Find the total differential of the function $y=(11x + 9)^3$
11. Find the total differential of the function $Z=\sqrt{x-y}$
12. Find the total differential of the function $Z=\frac{x}{x+y}$
13. Find the total derivative dz/dx for $Z=\frac{9x-7y}{2x+5y}$ where as $y = 3x-4$.
14. Find the total derivative dz/dx for $Z = 8x - 12y$ where $y = \frac{x+1}{x^2}$
15. Find derivative dy/dx of the implicit function $6x^2 + 15xy + 3y^2 = 363$.
16. Find derivative dy/dx of the implicit function $3x^2 + 13xy + 7y^2 = 324$.
17. Find derivative dy/dx of the implicit function $4x^2 + 5xy + 3y^3 = 853$.
18. Find derivative dy/dx of the implicit function $x^4 y^6 = 676$.
19. Find the relative extrema of the function $f(x) = -7x^2 + 126x - 23$.
20. Find the relative extrema of the function $f(x) = 3x^3 - 36x^2 + 135x - 13$.
21. Find the relative extrema of the function $f(x) = 2x^4 - 16x^3 + 32x^2 + 5$.
22. State the condition for relative maximum in case of multi variable function?
23. State the condition for relative minimum in case of multi variable function?
24. Optimize the function $y = 7x^2 + 112x - 54$.
25. Optimize the function $y = -9x^2 + 72x - 13$.
26. Optimize the function $y = x^3 - 6x^2 + 135x + 4$.
27. Optimize the function $y = -2x^3 + 15x^2 + 84x - 25$.
28. Optimize the function $y = x^4 - 8x^3 - 80x^2 + 15$.
29. Optimize the function $y = -(x + 13)^4$
30. Optimize the function $y = (9 - 4x)^4$
31. Maximize the function and find the maximum value $TR = 32q - q^2$.
32. Maximize the function and find the maximum value $\pi = -q^2 + 11q - 24$.
33. Maximize the function and find the maximum value $q^3 - 6q^2 + 1440q - 545$.
34. What is convex set?
35. What is convex function?
36. Determine the integral $\int (2x^6 - 3x^4) dx$.
37. Determine the integral $\int 2^{4x} dx$.
38. Determine the integral $\int e^{5x} dx$
39. Determine the integral by using the substitution method $\int x^4(2x^5 - 5)^4 dx$.

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40. Determine the integral by using the substitution method $\int (x - 9)^{\frac{7}{4}} dx$.
41. Determine the integral by using the substitution method $\int (6x - 11)^{-5} dx$.
42. Determine the integral by using the substitution method $\int \frac{1}{9x-5} dx$.
43. Determine the integral by using the substitution method $\int 24xe^{3x^2} dx$.
44. Determine the integral by using the by parts method $\int x^2 - e^{2x} dx$.
45. Determine the integral by using the by parts method $\int \frac{5x}{(x-1)^2} dx$.
46. Determine the integral by using the by parts method $\int 15x(x + 4)^{\frac{3}{2}} dx$.
47. Evaluate the definite integral $\int_0^3 4e^{2x}$
48. Evaluate the definite integral $\int_0^{10} 2e^{-2x}$ Type equation here.
49. What is Border Hessian Determinant?
50. State the necessary and sufficient condition for constraint maxima?
51. State the necessary and sufficient condition for constraint minima?

GROUP-D

1. Develop an input output model for the economy which is divided into three producing industries. Also point the procedure for its solution?
2. Explain Hawkins-Siman conditions. Are these conditions satisfied for for $A = \begin{bmatrix} 1.2 & 0.3 \\ 0.4 & 1.8 \end{bmatrix}$.
3. A three sector economy has the following input coefficient matrix A and the final demand vector F. $A = \begin{bmatrix} 0.3 & 0.2 & 0.2 \\ 0.2 & 0.1 & 0.5 \\ 0.2 & 0.4 & 0.2 \end{bmatrix}$ $F = \begin{bmatrix} 80 \\ 30 \\ 50 \end{bmatrix}$. Find the gross output of each sector to meet the final demand. What would be the labour requirement for the final output of the three industries.

A three sector economy has the following input coefficient matrix A and the final demand vector F: $A = \begin{bmatrix} 0.2 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.3 \\ 0.3 & 0.5 & 0.2 \end{bmatrix}$ $F = \begin{bmatrix} 150 \\ 200 \\ 210 \end{bmatrix}$ Find the gross output of each sector to meet the final demand.

5. Analyse the assumption, uses and limitations of input output model?
6. In a closed input output model, the interrelationship between the industries of the economy and the final demand are given below:

Industry	A	B	C	Final Demand
A	10	4	8	14
B	4	6	8	18
C	6	4	4	10

Calculate the output levels of the three industries consistent with the model.

7. Find the 2nd and 3rd order differential coefficients w.r.t x (i) $y = 3x^3 - 9x$ (ii) $y = x^2 \log x$.
8. Find the 2nd and 3rd order differential coefficients w.r.t x when $y = xe^{x^2}$

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9. Shows that $y = x^2 - 2x - 3$ is concave upward and $y = 5 - 3x - x^2$ is concave downward.
10. Prove that the curve given by $3y = x^3 - 3x^2 - 9x + 11$ has a maximum at $x = -1$ and minimum at $x = 3$ and point of inflexion at $x = 1$
11. Maximize profit π for a firm, given total revenue $R = 4000q - 33q^2$ and total cost $C = 2q^3 - 3q^2 + 400q + 5000$, assuming $q > 0$
12. Find derivative dy/dx of the implicit function $4x^2 + 5xy + 3y^3 = 853$ and $x^4 y^6 = 676$.
13. Find the total differential of the functions $z = \frac{9y^3}{x-y}$ and $z = (x - 3y)^3$.
14. Find the relative extrema of the function $f(x) = 3x^3 - 36x^2 + 135x - 13$ and $f(x) = 2x^4 - 16x^3 + 32x^2 + 5$
15. Optimize the function $y = x^3 - 8x^2 - 80x + 15$ and $y = -(x + 13)^4$
16. Optimize the function $y = x^3 - 6x^2 + 135x - 4$ and $y = -2x^3 - 15x^2 + 84x - 25$.
17. Optimize the multi variable function $z = 3x^2 - xy - 2y^2 - 4x - 7y + 12$
18. Optimize the multi variable function $z = 48y - 3x^2 - 6xy - 2y^2 - 72x$
19. Optimize the multi variable function $f(x, y) = x^3 - 5y^2 - 225x + 70y + 23$.
20. Optimize the multi variable function $f(x, y) = 3x^3 - 9xy + y^3$.
21. Explain the properties of definite integral?
22. Given the demand function $P = 45 - 0.5q$ find the Consumer surplus at $P = 32.5$ $Q = 25$.
23. Given the supply function $p = (q + 3)^2$ find the producer surplus at $p = 81$ and $q = 6$.
24. Given the demand function $p = 25 - q^2$ and the supply function $p = 2q + 1$ assuming perfect competition find consumer and producer Surplus.
25. Integrate the following definite integral by using the methods of integration by parts $\int_2^5 \frac{3x}{(x+1)^2} dx$ and $\int_2^5 \frac{4x}{(x+2)^3} dx$.
26. Determine the integral by using the substitution method $\int \frac{1}{9x-5} dx$ and $\int 24xe^{3x^2} dx$.
27. What combinations of goods x and y should a firm produce to minimize costs when the joint cost function is $C = 6x^2 - 10y^2 - xy + 30$ and the firm has a production quota of $x + y = 34$, estimate the effect on cost if the production quota reduced by 1 unit.
28. What output mix should a profit maximizing firm produce when its total profit function is $\pi = 80x - 2x^2 - xy - 3y^2 + 100y$ and its maximum output capacity is $x + y = 12$.
29. Minimize cost for a firm with the cost function $C = 65 + 2xy + 3y^2 + 800$, subject to the production quota $x + y = 39$.
30. Maximize utility $u = q_1 q_2$ when $p_1 = 1$ and $p_2 = 4$ and Budget = 120.
31. Optimize the CD production function $q = k^{0.3} l^{0.5}$ subject to the constraint $6K + 2L = 384$.
32. What is constraint optimization? Explain the process of constraint optimization by using Lagrange-Multiplier method.

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