

2022

ECONOMICS

(*Mathematical Methods for Economics-II*)

Paper—IV

Full Marks : 80

Time : 3 hours

Answer all questions

The figures in the right-hand margin indicate marks

1. Answer all the following questions : 1 × 12

ନିମ୍ନ ମଧ୍ୟରେ ଯମତ୍ର ପ୍ରଶ୍ନର ଉତ୍ତର ଲେଖ :

(a) The input-output analysis was invented by the Americal professor _____.

ଆମେରିକୀୟ ପ୍ରଫେସର _____ କ ଦ୍ଵାରା ଇନ୍ପୁଟ-ଆଉଟପୁଟ କୌଶଳ ଉତ୍ତାବନ କରାଯାଇଥିଲା ।

(b) The model where the entire output of the producing sectors are consumed by the producing sectors themselves, the model is known as a _____ model.

ଯେଉଁ ମଡେଲରେ ଉତ୍ପାଦନ କ୍ଷେତ୍ରଗୁଡ଼ିକ ଉତ୍ପାଦନକୁ ନିଜ ମଧ୍ୟରେ ଉପଭୋଗ କରନ୍ତି ଏହାକୁ _____ ମଡେଲ କୁହାଯାଏ ।

(c) If $y = \log_a x$, $\frac{dy}{dx} = \underline{\hspace{2cm}}$.(d) The function $x^2 + y^3 - y^2 + xy = 3$ is a _____ function.(e) The slope of the function $y = x^2 - 3x + 4$ at $x = 1$ is _____.ଯଦି ଫଳନଟି $y = x^2 - 3x + 4$ ହୁଏ ତେବେ ଫଳନର ସ୍ଵେପ _____ ହୋଇଥାଏ ଯେତେବେଳେ $x = 1$ ।(f) The curve $y = f(x)$ is convex downward if $\frac{d^2y}{dx^2} = \underline{\hspace{2cm}}$.

(Turn Over)

II-CC—Eco-IV

(Continued)

$y = f(x)$ ବକ୍ରଟି ଉତ୍ତଳାକାର ନିମ୍ନଭାଗୀ ହୁଏ ଯେତେବେଳେ

$$\frac{d^2y}{dx^2} = \text{_____} ।$$

(g) A function $z = f(x, y)$ is said to be homogeneous of degree 'n', if for any real number λ , $f(\lambda x, \lambda y) = \text{_____}$.

(h) If $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} > 0$, then the function attains its _____ value .

ଯଦି $\frac{dy}{dx} = 0$ ଏବଂ $\frac{d^2y}{dx^2} > 0$ ହୁଏ ତେବେ ଫଳନଟି
ଚାହାର _____ ମୂଲ୍ୟରେ ପହଞ୍ଚେ ।

(i) If $z = f(x, y)$, the second order sufficient condition for maximisation is $f_{xx} < 0$, $f_{yy} < 0$ and $f_{xx} \cdot f_{yy} > \text{_____}$.

(j) The maximum and minimum value of a function, together called the _____ value of the function.

ଏକ ଫଳନର ସର୍ବୋଚ୍ଚ ଓ ସର୍ବନିମ୍ନ ମୂଲ୍ୟ ଦୃଷ୍ଟକୁ _____
ମୂଲ୍ୟ ମଧ୍ୟ କୁହାଯାଏ ।

$$(k) \int dx = \text{_____} .$$

$$(l) \int e^x dx = \text{_____} .$$

2. Answer any *eight* of the following questions :
ଯେ କୌଣସି ଆଠଟି ପ୍ରଶ୍ନର ଉତ୍ତର ଦିଅ : 2 × 8

(a) Write down three important assumptions of input-output analysis.

ଇନପୁଟ-ଆଉଟପୁଟ ମଡେଲର ତିନୋଟି ମୁଖ୍ୟ ଅନୁମାନ
ଦର୍ଶାଅ ।

(b) Define an open input-output model.

ଏକ ଉନ୍ମୁକ୍ତ ଇନପୁଟ-ଆଉଟପୁଟ ମଡେଲର ସଂଜ୍ଞା ପ୍ରଦାନ
କର ।

(c) What are the Hawkins-Simon conditions ?
Hawkins ଓ Simon କି ସର୍ତ୍ତାବଳୀ ଗୁଡ଼ିକ କ'ଣ ?

(d) If $y = e^{x^2+3x+a}$, find $\frac{dy}{dx}$.

(e) Show that the curve $y = x^2$ is convex downward.

$y = x^2$ ବକ୍ରଟି ଉତ୍ତଳାକାର ନିମ୍ନଗାମୀ ବୋଲି ଦର୍ଶାଅ ।

(f) If $z = 2x^2 + 3xy$, find f_x and f_y .

(g) Define a linear homogenous function.

(h) What does Euler's theorem signify?

Euler' କ ଉପପାଦ୍ୟଟି କ'ଣ ଦର୍ଶାଇଥାଏ ?

(i) Define a definite integral.

(j) Integrate $\int \left(\frac{1}{x} + \Gamma x + e^x \right) dx$.

3. Answer any *eight* of the following questions :
ଯେ କୌଣସି ଅଠଟି ପ୍ରଶ୍ନର ଉତ୍ତର ଦିଅ : 3 x 8

(a) What are the technological coefficients in input-output analysis ?

ଉତ୍ପାଦ-ଆଉଟପୁଟ ମଡେଲରେ "Technological Coefficients" କହିଲେ କଣ ବୁଝ ?

(b) Distinguish between closed and open input-output models.

ବନ୍ଦ ଓ ଉନ୍ମୁକ୍ତ ଉତ୍ପାଦ-ଆଉଟପୁଟ ମଡେଲ ମଧ୍ୟରେ ପାର୍ଥକ୍ୟ ଦର୍ଶାଅ ।

(c) Differentiate $y = x^2$ from the first principle.

(d) If $y = x^{e^x}$, find $\frac{dy}{dx}$.

(e) If $x = at^2$ and $y = 2at$ find $\frac{dy}{dx}$.

(f) Find the slope of the curve $y = \frac{x^2 - 12}{x - 4}$ at the point (0, 3).

(g) Show that the curve $y = x^2(3 - x)$ has a point of inflection at the point (1, 2).

(h) If $u = \log(x^2 + y^2 + z^2)$, show that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 2.$$

- (i) Distinguish between convex and concave functions.

(j) $\int x \log x \, dx$ (Integrate).

Answer all questions : 7×4
ସମସ୍ତ ପ୍ରଶ୍ନର ଉତ୍ତର ଦିଅ :

4. Define an input-output model and explain the procedure of finding out the optimum output in a 3-industry model. <https://www.odishastudy.com>

ଏକ ଉତ୍ପାଦ-ଆଉଟପୁଟ୍ ମଡେଲର ସଂଜ୍ଞା ପ୍ରଦାନ କରି ଓ ଶ୍ରେଣି ବିଶ୍ଳେଷ ମଡେଲରେ କିପରି ସର୍ବୋତ୍ତମ ଉତ୍ପାଦ ନିର୍ଣ୍ଣୟ କରାଯାଏ ବର୍ଣ୍ଣନା କର ।

Or
ଅଥବା

If $A = \begin{bmatrix} 0.3 & 0.4 & 0.2 \\ 0.2 & 0.0 & 0.5 \\ 0.1 & 0.3 & 0.1 \end{bmatrix}$ and $F = \begin{bmatrix} 100 \\ 40 \\ 50 \end{bmatrix}$

Calculate the optimum output of three industries.

5. If $y = x^{x^x}$ find $\frac{dy}{dx}$

Or
ଅଥବା

If $z = x^3 \log\left(\frac{y}{x}\right)$ then show that

$$x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 3z$$

6. Integrate $\int x^n \log x \, dx$

Or
ଅଥବା

Find out the maximum and minimum values of the function $y = x^3 - 2x^2 + x + 6$.

7. Explain the procedure of finding out the extreme value of a multivariate function.

ଏକ ମଲ୍ଟି-ଭାରିଏବଲ୍ ଫଳନର ଚରମ ମୂଲ୍ୟ ନିର୍ଦ୍ଧାରଣ କରିବାର ପଦ୍ଧତିକୁ ବର୍ଣ୍ଣନା କର ।

Or

ଅଥବା

Using lagrangian multiplier and hessian determinant find out the extreme value of the function $z = x_1^2 + x_2^2$ subject to $x_1 + 4x_2 = 2$.

ଲାଗ୍ରାଞ୍ଜିଆନ ଗୁଣକର୍କା ଓ ହେସିଆନ ନିର୍ଣ୍ଣୟକାରୀ ବ୍ୟବହାର କରି ଉପରୋକ୍ତ ଫଳନର ଚରମ ମୂଲ୍ୟ ନିର୍ଦ୍ଧାରଣ କର ।

<https://www.odishastudy.com>

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