Bachelor's Degree Programme (BDP)

## ASSIGNMENT

2021-22

## Course Code : BECE-15

Title of the Course: ELEMENTARY MATHEMATICAL METHODS IN ECONOMICS


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# BECE-15 : ELEMENTARY MATHEMATICAL METHODS IN ECONOMICS <br> Assignment 

2021-22
Dear Student,
As explained in the programme guide for BDP, you will have to do one assignment for this elective course in BECE-15. This is a Tutor Marked (TMA) and carries 100 marks.

Before attempting the assignment please read the instructions provided in the programme guide sent to you separately.

Submission: The completed assignments should be submitted to the Coordinator of your Study Centre on or before March 312022 for July 2021 students and October 312022 for January 2022 students

# BECE-15: ELEMENTARY MATHEMATICAL METHODS IN ECONOMICS 

July 2021-January 2022
TMA
Programme: BDP
Course Code: BECE-15
Assignment Code: BECE-15/AST/TMA/2021-22
Max. Marks: 100

## A. Long Answer Questions <br> (Answer any two questions)

$\mathbf{2 \times 2 0}=\mathbf{4 0}$

1. A monopolist faces the demand curve $\mathrm{Q}=60-\mathrm{P} / 2$. The cost function is $\mathrm{C}=\mathrm{Q}^{2}$. Find the output that maximises this monopolist's profits. What are the prices at profits and that output? Find the elasticity of demand at the profit maximising output.
2. A firm in a perfectly competitive market has the following cost function:
$C=1 / 3 q^{3}-5 q^{2}+30 q+10$
If the market-clearing price is 6 , obtain the profit maximising level of output.
3. Consider the following Macro-Model (Multiplier - Accelerator Interaction):

$$
\begin{aligned}
& \mathrm{Y}_{\mathrm{t}}=\mathrm{C}_{\mathrm{t}}+\mathrm{I}_{\mathrm{t}}+\mathrm{G}_{\mathrm{t}} \\
& \mathrm{C}_{\mathrm{t}}=\mathrm{C}_{0}+\alpha \mathrm{Y}_{\mathrm{t}-1} \\
& \mathrm{I}_{\mathrm{t}}=\mathrm{I}_{0}+\beta\left(\mathrm{C}_{\mathrm{t}}-\mathrm{C}_{\mathrm{t}-1}\right)
\end{aligned}
$$

Where $0<\alpha<1 ; \beta>0 ;$ and $\mathrm{G}_{\mathrm{t}}=\mathrm{G}_{0}$
i) Find the time path $\mathrm{Y}(\mathrm{t})$ of national income, and
ii) Comment on the stability conditions.
4. Discuss the importance of the Hawkins-Simon conditions in input-output analysis.
B. Medium Answer Questions
(Answer any three questions)
5. Using Cramer's rule solve the following equations:
(i) $x+y-2=0$

$$
\begin{aligned}
& 2 x-y+2=3 \\
& 4 x+2 y-22=2
\end{aligned}
$$

(ii) $x+2 y=9$
$2 x-3 y=4$
6. Find the short run average cost for the production function $q=$ $\mathrm{AL}^{1 / 3} \mathrm{~K}^{2 / 3}$ where total cost $(\mathrm{TC})=\mathrm{wL}+\mathrm{rK}$, the symbols having their usual meaning.
7. Find the matrix inverse of

$$
\left[\begin{array}{rrr}
7 & -8 & 5 \\
4 & 3 & -2 \\
5 & 2 & 4
\end{array}\right]
$$

8. Determine the eigenvalues and eigenvectors of the matrix

$$
A=\left(\begin{array}{ll}
5 & 4 \\
1 & 2
\end{array}\right)
$$

9. i) Let $Y=\frac{2 x^{2}+3 x+1}{3 x^{2}-4 x+1}$

For what values of x will be the function be discontinuous?
ii) Show that $\frac{a_{1} x^{2}+b_{1} x+c_{1}}{a_{2} x^{2}+b_{2} x+c_{2}}$
tends to $\mathrm{a}_{1} / \mathrm{a}_{2}$ as $\mathrm{x} \rightarrow \infty$
10. Determine the distance between the points:
i) $(3,0,7)$ and $(-4,8,2)$
ii) $\quad(4,6,7,1)$ and $(-3,0,2,4)$
iii) The distance between the points $(3,1,2,4)$ and $(4,6,5, \lambda)$ is 200 . What can be said about the value of $\lambda$ ?
C. Short Answer Questions $3 \times 8=24$ (Answer any three questions)
11. Evaluate the Limits of
$\frac{X^{2}-X-2}{X(X-2)} A s X \rightarrow 2$.
12. If the demand function for a good is $\mathrm{Q}=140-5 \mathrm{P}$, what is the price elasticity of demand at $\mathrm{P}=15$ rupees?
13. If $\mathrm{Z}=\mathrm{f}(\mathrm{x}, \mathrm{y})=\mathrm{xy}$

Find the maximum value for $f(x, y)$ if $x \& y$ are constrained to sum to 1 (That is $x+y=1$ ). Solve the problem in two ways: by substitution and by using the Lagrangian multiplier method.
14. Define
a. Adjugate of a matrix
b. Decomposable matrix
c. Singular matrix
15. Determine the characteristic roots and the characteristic vectors of the matrix

$$
A=\left(\begin{array}{ll}
2 & 2 \\
1 & 0
\end{array}\right)
$$

## 16. INTEGRATE

(i) $\quad x \operatorname{Sin} x$ etc.
(ii) $\sqrt{\left(a^{2}-x^{2}\right) d x}$

