

[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 134

Roll No.....

Unique Paper Code : 248605

Name of the Course : B.A. (Hons.), Business Economics

Name of the Paper : ADVANCED MATHEMATICAL TECHNIQUES

Semester : VI (2014)

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. 1 is compulsory.
3. Attempt any **four** out of the rest **five** questions.
4. **All** questions carry equal marks.

1. (a) Find the extreme value(s) of $Z = 8x^3 + 2xy - 3x^2 + y^2 + 1$.

(b) Determine whether $z = 2x^2 + 3y^2 - w^2 - 6xy - 8xw - 2yw$ is either positive or negative definite.

(c) Find the characteristic root of the vectors of the matrix $\begin{pmatrix} 2 & 3 & 2 \\ & & -1 \end{pmatrix}$ where $\begin{pmatrix} 2 & 3 \end{pmatrix}$ is the first row and $\begin{pmatrix} 2 & -1 \end{pmatrix}$ is the second row.

2. Do all **three** :

(a) Find the extreme values of $z = x_1^2 + 3x_2^2 - 3x_1x_2 + 4x_2x_3 + 6x_3^2$. Write the first and second order condition.

(b) Check $z = x_1^2 + x_2^2$ for concavity or convexity.

(c) A two-product firm faces the following demand and cost functions

$$Q_1 = 40 - 2P_1 - P_2 \quad Q_2 = 35 - P_1 - P_2 \quad C = Q_1^2 + 2Q_2^2 + 10$$

Find the output level that satisfies the first order condition for profit maximization.

Check the second order condition. Can you conclude that this problem possesses a unique absolute maximum ?

What is the maximum profit ?

P.T.O.

3. (a) Find the extreme value(s) of $z = x + 2y + 3w + xy - yw$ subjected to the constraint $x + y + 2w = 10$.
- (b) Is the following function homogenous if yes then mention the degree.
 $f(x, y) = \sqrt{xy}$
 $f(x, y) = 2x + y + 3\sqrt{xy}$
 $f(x, y) = xy^2/w + 2xw$
 $f(x, y) = x^3 - xy + y^3$
- (c) Given $u = (x + 2)(y + 1)$ and $P_x = 4$ and $P_y = 6$ and $B = 130$
 Write Lagrangian function.
 Find the optimal consumption bundle.
 Is the second order condition satisfied?
4. (a) Develop a second order difference equation for multiplier accelerator model.
- (b) Explain second order difference equation? Solve the difference equation

$$Y_{t+2} - \frac{1}{6}Y_{t+1} - \frac{1}{6}Y_t = 0$$
- (c) What do you mean by solution of a difference equation? Explain the behavior of general solution.
5. (a) Minimize $z = (x_1^2 - 4)^2 + (x_2^2 - 4)^2$
 subject to $2x_1 + 3x_2 \geq 8$
 $-3x_1 - 2x_2 \geq -10$
 $x_1, x_2 \geq 0$
- (b) Solve the following difference equation
 $y''(t) + 6y'(t) + 9y(t) = 27$
- (c) Explain the meaning of complementary function.
6. (a) Find the extreme value(s) of $z = x + y + 3w + xy - yw$ subjected to the constraint $x + y + 2w = 10$ and $x + y = 15$.
- (b) Solve the following differential equation
 $y''(t) = 20$
- (c) Find the general solution of the following difference equation $Y_{t+1} + 6Y_t = 4$.