

**BACHELOR OF ARTS EXAMINATION, 2017**

( 1st Year, 2nd Semester )

**ECONOMICS (HONOURS)****MATHEMATICAL ECONOMICS I (OLD)**

Time : Two hours

Full Marks : 30

Answer question 1 . Choose any one from the rest.

1. Proof whether the following statements are true or false? Give reasons and show necessary derivations for your answer.

a) The following function has a relative extreme at a point where first order condition of optimization is not satisfied:  $f(x) = |x - 5|$

b) Consider the following function

$d = \sqrt{x^2 + (y - b)^2}$  subject to  $x^2 = 4y$ . In its domain the minimum occurs at a critical point for  $b < 2$ .

c) Consider the following function:

$$z = f(x, y) = x^4 - 4xy^3$$

It has a relative extremum at  $x=0, y=0$

d) The level curves corresponding to this function is strictly convex to origin:

$$f(x, y) = \frac{y}{x+1}$$

e) Which of the following functions are homothetic? Give a reason for each answer.

$$Z = x^2y + xy \quad Z = e^{x^2y} e^{-xy^2}$$

f) Let S be the set of all points (x,y) in the plane satisfying the given inequalities:  $1 \leq x \leq 2$  and  $3 < y < 4$ . The S is a compact and convex. 3 × 6 = 18

2. a) Consider the following maximization problem:

$$f(x, y) = ax^2 - x + by^2 - y$$

Find out the optimal values for x and y

Under what restriction on a and b second order condition will be satisfied.

b) Consider the following problem: Minimise  $f = 3x + \sqrt{3}y$

[ Turn over

Subject to

$$3 - \frac{18}{x} - \frac{6\sqrt{3}}{y} \geq 0$$

$$x \geq 5.73$$

$$y \geq 7.17$$

Find out all feasible solutions.

c) State and prove Shepherd's Lemma

[3 + 6 + 3 = 12]

3. a) Consider the following problem:

$$\text{Max } z = 4x + 6y$$

Subject to

$$x \geq 0; \quad y \geq 0;$$

$$-x + y \leq 11$$

$$x + y \leq 27$$

$$2x + 5y \leq 90$$

i) Graphically show the feasible set and show that it is convex.

ii) Graphically find out the optimal solution.

b) Suppose a firm undertakes advertising (x) and marketing cost(y) to maximize profit.

$$q = 100(x + y) + 20xy - 12.5(x^2 + y^2)$$

i) Draw iso-profit curves? 2

ii) When iso-profit curve will converge to a point? What is the interpretation of this point?

c) Consider the following utility function:

$$U = 2x_1^{1/2} + 4x_2^{1/2}$$

Find out indirect utility function and expenditure function.

[(2 + 2) + {2 + (2 + 1) + 3} = 12]