

P.G. 1st Semester - 2017**ECONOMICS****Paper : MECOCCT-103**

Full Marks : 40

Time : 2 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*Answer any **four** of the following.

1. a) Examine the function $y = -x^4$ for its relative extremum.
- b) Prove the following:
 - i) A concave function is related to convex set.
 - ii) Under imperfect competition MR curve can be upward sloping. 3+(3+4)
2. Consider the following problem:

$$\text{Max } Z = f(x, y)$$

subject to $g(x, y) = c$

 - a) Construct the Lagrangian function. Interpret the Lagrangian multiplier.

- b) Derive the Envelope Theorem for this model. 5+5

3. a) Show that $f(x, y) = x^\alpha y^\beta$ ($x, y > 0$; $0 < \alpha, \beta < 1$) is strictly quasiconcave.
- b) Suppose $y = f(x)$. Explain the First Derivative Test for relative extremum. 6+4
4. Consider an NLP. Explain the following:
 - a) Constraint Qualifications.
 - b) Concave programming. 6+4
5. a) Distinguish between function and functional.
- b) Find the optimal path that will

$$\text{Maximize } \int_0^T -(t^2 + u^2) dt$$

$$\text{subject to } y' = u$$

$$\text{and } y(0) = 4 \quad y(T) = 5 \quad T \text{ free}$$

Explain your results. 3+7

6. a) What do you mean by autonomous problem?
- b) Consider the optimal growth problem:

$$\text{Maximize } \int_0^\infty u(c) e^{-\rho t} dt$$

subject to $k' = \phi(k) - c - (n + \sigma)k$

$$k(0) = k_0$$

and $0 \leq c(t) \leq \phi(k)$

where, k : State variable and c : control variable. Construct the phase diagram in the kc space. Analyze the phase diagram.

2+5+3
