MASTER OF ARTS EXAMINATION, 2018

(1st Year, 1st Semester, Old Syllabus)

ECONOMICS

MATHEMATICAL ECONOMICS

Time : Two hours

Full Marks : 30

Answer any three questions

1. Maximize $\int_0^T [K - \alpha K^2 - I^2]dt \quad \alpha > 0$

   S.t. $\dfrac{dK}{dt} = I - \delta K \qquad \delta > 0$

   $K(0) = K_0$, given

   $K(T)$ free. 10

2. What do you mean by transversality condition in the context of optimum control problem? Show that transversality conditions essentially depend on the endpoint conditions on state variable. 2+8

3. The Forster's model on antipollution policy gives us the following optimal control problem:

   Max $\int_0^T U[C(E), P]dt$,

   Where $U_C > 0, U_P < 0$

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$U_{CC} < 0, \qquad U_{PP} < 0$

$C' > 0, C'' < 0$

S.t. $\dot{P} = \alpha E - \beta A - \delta P \quad \alpha, \beta, \delta$ are all positive.

$\dot{S} = -A - E$

Where ,

$P(0) = P_0 > 0$, $P(T) \geq 0$ free (T given),

$S(0) = S_0, \; S(T) \geq 0$ free

and $E \geq 0, \quad 0 \leq A \leq \hat{A}$

Using the information given, show that while E has an interior solution , A has a boundary solution in the optimum. Discuss the economic meaning of anti-pollution policy in this context. 10

4. We wish to move from the initial point (0,8) in the t-y plane to achieve the terminal state value y(T)=0 as soon as possible. Formulate and solve the problem, assuming that $\frac{dy}{dt} = 2u$ and the control set is the closed interval [-1,1]. 10

5. Give the economic meaning of different parts of optimum control problem. 10