

Indian Institute of Technology, Humanities and Social Sciences Department,
Selection Procedure for PhD Admissions, May 2016
Total Marks: 100; Duration: 2 hours

ECONOMICS

Answer ANY FOUR questions

Q1 [25 marks].

1. The following is from a photo essay by Sayantan Bera in the Live Mint newspaper (10 May 2016) on the drought situation in Budelkhand:

“The people of Bundelkhand, a chronically drought prone region spread across 13 districts in Uttar Pradesh and Madhya Pradesh, are adjusting themselves to yet another drought. The 13th in the past 15 years. But this year the situation is worse as many families have lost their cattle due to an acute shortage of fodder. A non-functional public distribution system means households have cut down on meals. . Entire families have moved out to work as labourers, leaving behind the old to fend for themselves. The government is invisible except for the occasional tanker supplying drinking water in parched villages”.

Why do you think is India’s rural population still dependent on the monsoons? Should the government intervene to ensure faster income and employment growth in rural areas and also to achieve greater equity in the countryside? If yes, suggest a few ways the government can effectively intervene in the rural areas. (10+5+10)

Q2 [25 marks].

A 2011 study by K.S. Chalapati Rao and Biswajit Dhar revealed that the bulk of the total foreign direct investment (FDI) equity inflows into India during 2005-08 were into finance, construction and real estate, while manufacturing received a share of 20.6% of these FDI flows. Further, Rao and Dhar (2011) showed that a large proportion - 40.3% in 2006-07 - of FDI flows into India in recent years has gone into the acquisition of shares of domestic enterprises by foreign companies.

What do you think is the role of FDI in Indian development? (Your answer can be based on the above information as well as your knowledge on this topic).

Q3 [25 marks].

Consider the following model of growth. Production function is given by

$$Y(t) = K(t)^\alpha (A(t)L(t))^{1-\alpha}.$$

Capital and knowledge accumulate according to the following equations of motions;

$$\begin{aligned} \dot{K}(t) &= sY(t), & s \in (0, 1), \\ \dot{A}(t) &= Y(t)^\phi, & \phi \in (0, 1). \end{aligned}$$

The population growth rate is n which is given as constant.

- (1) Give an economic interpretation of the equation for the accumulation of knowledge. (3 marks)
- (2) For what values of ϕ does this model get closer to a Solow model of growth? (2 marks)
- (3) Let $g_A(t) = \frac{\dot{A}(t)}{A(t)}$ and $g_K(t) = \frac{\dot{K}(t)}{K(t)}$ be the growth rates of knowledge and capital, respectively. Find expressions for $g_A(t)$ and $g_K(t)$ in terms of $A(t)$, $K(t)$, $L(t)$ and the parameters. (3 marks)
- (4) Can you obtain expressions for $\dot{g}_A(t)$ and $\dot{g}_K(t)$ in terms of $g_A(t)$ and $g_K(t)$ and the parameters? Draw the phase diagram in (g_A, g_K) space. (3+4 marks)
- (5) Does the economy converge to a balanced growth path? If so, what are the growth rates of K , A and Y on the balanced growth path? (3 marks)
- (6) How does an increase in s affect the long run (per-capita output) growth? What about an increase in n ? What happens when ϕ gets close to one. (3*1=3 marks)
- (7) Do you think that this is a reasonable model to explain differences in the growth rates across countries? (1 mark)
- (8) Now endogenize savings rate by introducing a representative household with utility function

$$U = \int_{t=0}^{\infty} e^{-\rho t} \frac{C(t)^{1-\sigma}}{1-\sigma} dt;$$

where $\rho > 0$, $\sigma > 0$ and $\rho > \frac{1-\sigma}{1-\phi}n$. Do you think, endogenizing savings in this way will change the balanced rate of growth of this economy? Discuss in detail. (3 marks)

Q4 [15 + 10 = 25 marks. This question has two parts - **Q4.1** and **Q4.2**. You have to answer both.]

Q4.1.

State whether the following statements are *true* or *false* and explain your picks:

- (a) The assumption of convexity of the budget space is compatible only with certain white goods like refrigerators, washing machines etc. that are available in discrete quantities. (5 marks)
- (b) If preferences are non-satiated and strictly convex, they are locally non-satiated. (5 marks)
- (c) Lexicographic preferences can be numerically measured by a utility function but none of the utility functions that represent these preferences will be continuous. (5 marks)

Q4.2.

Consider two firms competing in a differentiated product market. The demand function for firm i , $i = 1, 2$, is given by $D_i(P_i, P_j) = a - bP_i + dP_j$; $0 < d < b$. Assume that there is a per unit cost of production for each firm and the cost parameter is denoted by $c_i > 0$. Suppose that c_2 is a common knowledge, i.e. both the firms know it. But c_1 is known only to firm 1. For firm 2, c_1 can take only two values: c_1^l (with probability x), c_1^h (with probability $(1 - x)$, where $c_1^h > c_1^l$. Discuss and characterize the equilibrium in this price competition model. [10 marks]

Q5 [25 marks]

- 1) Show that $E(X|Y) = E(X)$ implies that $Cov(X, Y) = 0$. (3 marks)
- 2) Consider a multiple linear regression model with three independent variables, under the assumptions of the classical normal linear regression: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + U$. You would like to test the null hypothesis $H_0 : \beta_1 - 3\beta_2 = 1$ against $H_1 : \beta_1 - 3\beta_2 \neq 1$. Let $\hat{\beta}_1$ and $\hat{\beta}_2$ denote the *OLS* estimators of β_1 and β_2 . Find $Var(\hat{\beta}_1 - 3\hat{\beta}_2)$ in term of the variances of $\hat{\beta}_1$ and $\hat{\beta}_2$ and the covariance between them. What is the standard error of $\hat{\beta}_1 - 3\hat{\beta}_2$. Write the t statistic for testing $H_0 : \beta_1 - 3\beta_2 = 1$. Write a regression equation involving a new parameter that allows you to directly obtain $\hat{\beta}_1 - 3\hat{\beta}_2$ and its standard error. (12 marks)
- 3) Suppose you have a model, $Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + u_t$, and you find evidence of first-order serial correlation in the residuals. Explain how you could transform the model to obtain valid standard errors and efficient estimates. (10 marks)

THE END