This question paper contains 3 printed pages.

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Your Roll No. .....

M.A. / Winter Semester

A

ECONOMICS

Course 101— Mathematical Economics

(Admissions of 1999 and onwards)

Time : $2_{1/2}$ hours *Maximum Marks* : 70

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer any three of the following questions.

Each question is worth $23_{1/3}$ marks; marks for each part of a question are indicated at the end of the question.

Q.1 Consider a household with two members (1 and 2), each of whom gets utility from consuming a good c and leisure l. The household's problem then is to maximize its utility over its budget constraint, as below:

$$\text{Max. } U(c_1, c_2, l_1, l_2)$$

Subject to $p(c_1, c_2) + w_1 l_1 + w_2 l_2 \leq Y + T(w_1 + w_2)$

where p is the price of c, w is the wage rate, Y is the household's non-labor income and T is the individual time endowment.

a. Write down the test you would conduct for the validity of this model in terms of household resource allocation decisions. Point out <u>two</u> confounding factors in empirically testing the model's validity. [10 points]

Suppose the utility function of the household is now replaced by:

$$\sum_i \lambda_i U_i(c_i, l_i)$$

where $i=1, 2$ and $\sum \lambda_i = 1$

b. Are the implications of this model for the household's resource allocation process different from part a? Explain your answer. [5 points]

Turn over

c. Compare the implications for Pareto efficiency of resource allocation within households in the two models. [5 points]

Q.2. Suppose households have the following utility function:

$$U = U(c, e_1, e_2, b_1, b_2)$$

or

$$= V[c, W(e_1, e_2, b_1, b_2)]$$

c is parental consumption, e_i is life time earnings and b_i is the parental bequests to child i. W is the sub-utility function over e and b. Assume parents exhibit "equal concern."

Now, suppose parental preferences over e and b for two households (I and II) can be expressed, respectively, as:

I. $W^*[W^E(e_1,e_2), W^B(b_1,b_2)]$
II. $W[(e_1+rb_1), (e_2+rb_2)]$

where r is the rate of interest.

Parents maximize W(.) s.t.:

$$\sum_{i=1}^{2} b_i = I^b$$

$$P_s \sum_{i=1}^{2} S_i + \sum_{t=1}^{T} P_t \sum_{i=1}^{2} X_{it} = I^e$$

P is price and I is household income allocated to bequests (b) and earnings potential (e).

a. Derive the implications of the model for distribution of bequests between child 1 and 2 for household I from the sub-utility maximization process. [5 points]

b. In household I, what does the maximization of sub-utility function, W(.) imply for allocation of household resources to schooling (S) between child 1 and 2, if: $e_i = e(G_i, S_i, X_i)$ (in both households; G=genetic endowments, S= schooling, X=other goods) and $G_1 > G_2$? [10 points]

c. Compare your results in part b to the implications of preferences of household II for allocation of household resources to schooling between child 1 and 2 if $G_1 > G_2$. [5 points]

Q.3. Refer to the attached Figures (5 and 6) from the assigned course paper:
Qian, Nancy. 2008. "Missing Women and the Price of Tea in China: The Effect of Sex Specific Income on Sex Imbalance." *Quarterly Journal of Economics* 123(3).

a. Briefly, describe the natural experiment the author utilizes to identify the impact of sex specific income on human capital outcomes, by gender. [7 points]

b. Does the empirical evidence shown in this paper support rejection of the unitary framework of the household? Explain with specific reference to the results for sex-ratios and education. [8 points]

Q.4. Propose a research agenda on any of the topics covered in the course syllabus.

a. State and motivate your research question (100 words max.) [6 points]
b. Elaborate on the research innovation in you project in the context of the literature. (100 words max.) [9 points]