IES/ISS EXAM,2018

GENERAL ECONOMICS

Paper – I

Time Allowed : Three Hours	Maximum Marks : 200

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

*There are **THIRTEEN** questions divided under **THREE** sections.*

*The ONLY question in Section A is **compulsory**.*

*In Section B, **FIVE** out of **SEVEN** questions are to be attempted.*

*In Section C, **THREE** out of **FIVE** questions are to be attempted.*

Candidates should attempt questions/parts as per the instructions given in the sections. The number of marks carried by a question/part is indicated against it.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly.

Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

Candidates are required to write clear, legible and concise answers and to adhere to word limits wherever indicated. Failure to adhere to word limits may be penalized.

*Answers must be written in **ENGLISH** only.*

SECTION A

Q1. Answer all the following seven parts in about 100 words each : *5×7=35*

(a) Economic rent is not earned when the supply of a factor is perfectly elastic. Elucidate. Use a diagram. *5*

(b) Show that the elasticity of substitution is constant in a Cobb-Douglas production function. Find its value and interpret. *5*

(c) Consider the optimisation problem :

Maximize $u(x_1, x_2)$

subject to $M = p_1x_1 + p_2x_2$

where M, p_1 and p_2 are positive constants.

Write down the Lagrangian for this problem and explain why you need to assume that an interior solution exists before using the Lagrangian method to solve the problem. *5*

(d) An economy has 10 slave owners and 500 slaves. Slave owners like having slaves more than not having slaves, and slaves would rather be free than remain as slaves. Explain why the institution of slavery is Pareto optimal in this case. *5*

(e) Explain with a diagram why the compensated demand curve is vertical if the consumer's utility function is of the form : *5*

$$v(x, y) = \min[x, y]$$

(f) Pharmacies often give senior citizens discounts on medicines. Explain why this may be profit maximizing behaviour as opposed to pure generosity on the part of the pharmacy owners. *5*

(g) Suppose that the Government as a monopoly firm produces electricity and sells it to the people at a price p per unit. The demand (q) function for electricity is $q = \alpha\, p^{-\beta}$. If the price elasticity of demand for electricity in an absolute sense is found to be 0·894, should the Government reduce the price per unit to increase the revenue ? Justify your answer. *5*

SECTION B

Answer any *five* out of the following seven questions in about 200 words each : *18×5=90*

Q2. A price-taking consumer consumes two goods X and Y. Let x and y denote the quantities of goods X and Y respectively, and let P_X and P_Y be the respective prices of the two goods. Assume that (i) the consumer's budget is given by M, $\infty > M > 0$; and (ii) P_X and P_Y are finite and positive.

(a) Let the consumer's utility function be given by

$$U(x, y) = \min[x, y]$$

Define Indirect Utility Function and derive this consumer's Indirect Utility Function. *8*

(b) Suppose instead that his utility function is given by

$$U(x, y) = xy.$$

Define expenditure function and derive this consumer's compensated demand for good X using his expenditure function. *10*

Q3. Consider a one shot simultaneous move game with two players, Player 1 and Player 2. Let s_i, i = 1, 2 designate a pure strategy of player i. Let $s_i \neq 0$ be the pure strategy set of player i, and $\pi_i(s_1, s_2)$ be the pay-off function for player i, i = 1, 2.

(a) Define a Nash equilibrium in pure strategies for this game. *3*

(b) Consider the following game :

		Player 2	
		s_2^1	s_2^2
Player 1	s_1^1	10, 10	0, 12
	s_1^2	12, 0	3, 3

Show that the unique pure strategy Nash equilibrium is not Pareto optimal. *5*

(c) Consider two firms – Firm 1 and Firm 2 – producing a homogeneous good Q. The output of the two firms is given by q_1 and q_2 respectively.

The market inverse demand curve is given by P = A – bq, where A > 0, P is the price of the good and $q = q_1 + q_2$.

Suppose that there is no fixed cost and the average cost for each firm is c, $\infty > c > 0$.

Find the unique pure strategy Nash equilibrium of this game. *10*

Q4. Explain the concept of Social Welfare function. Does perfect competition ensure maximum social welfare ? Analyse critically. *18*

Q5. (a) How is quasi-rent different from rent ? *6*

(b) How can you get the wage offer curve and the supply curve of labour ? In a flourishing economy there is every possibility that the labour supply curve will be backward bending. Do you agree ? Justify your answer. *12*

Q6. (a) Show that even if the production function is not linear homogeneous, the expansion path can be a straight line passing through the origin. *6*

(b) Do you think that the Cobb-Douglas production function can analyse both the returns to a factor and returns to scale ? Explain logically. *6*

(c) Show that the concept of marginal product is implicit in the definition of the marginal rate of technical substitution. *6*

Q7. (a) How is the monopoly power measured ? State Lerner's measure of degree of monopoly power. Show that the degree of monopoly power is the inverse of the price elasticity of demand. *12*

(b) A monopoly firm's demand curve is given by $q = \frac{A}{P}$, where q is the quantity demanded, P is the price of the good, and A is a positive constant. There are no fixed costs. The average cost curve is given by $C(q) = cq$, where $\infty > c > 0$. Using a diagram, show that this firm does not have a profit maximizing output. *6*

Q8. Heights of fathers (X) and sons (Y) in inches are given in the following table :

X :	65	66	67	67	68	69	70	72
Y :	67	68	65	68	72	72	69	71

(a) Calculate the correlation coefficient between the heights of fathers and those of sons. *6*

(b) Obtain the equations of the lines of regression and the estimate of X for Y = 70. *6*

(c) Given that, $X = 4Y + 5$ and $Y = kX + 4$ are the lines of regression of X on Y and Y on X respectively. Show that $0 < 4k < 1$.

If $k = \frac{1}{16}$, what is the point of intersection of the two regression lines ? *6*

SECTION C

Answer any *three* out of the following five questions in about 300 words each : ***25×3=75***

Q9. (a) Consider the utility function

$$U = x^{\alpha} y^{\beta}, \ \alpha > 0, \beta > 0$$

which is to be maximized subject to the budget constraint $m = p_x x + p_y y$, where m = income (nominal) and p_x and p_y are the prices respectively per unit of the goods X and Y.

Derive the demand function for X and Y. Show that these demand functions are homogeneous of degree zero in prices and income. *6*

(b) Given the production function of a commodity $q = 40L + 3L^2 - \frac{L^3}{3}$, where q = output, L = labour input. Verify that when the average is maximum, it is equal to marginal product. Plot AP and MP on the graph paper. *4*

(c) Assume that there are three sectors. The input coefficient matrix A and the final demand vector d is given as follows :

$$A = \begin{bmatrix} 0{\cdot}3 & 0{\cdot}4 & 0{\cdot}2 \\ 0{\cdot}2 & 0 & 0{\cdot}5 \\ 0{\cdot}1 & 0{\cdot}3 & 0{\cdot}1 \end{bmatrix} \text{ and } d = \begin{bmatrix} 100 \\ 30 \\ 30 \end{bmatrix}$$

Would the amount of the primary input required be consistent with what is available in the economy ? *15*

Q10. (a) State briefly the assumptions of Kaldor's model of income distribution. *5*

(b) What do you mean by 'Widow's cruse' ? Distinguish between the two phrases 'savings according to the classes of income' and 'savings according to the income of the classes'. *10*

(c) Show that in Kaldor's model of income distribution 'the rate of profit' and 'the share of profit' are uniquely determined at equilibrium. *10*

Q11. Define Pareto's law of income distribution and state its applications. How is the Pareto distribution related to the Log-normal distribution ? For the Pareto distribution, calculate the Lorenz curve and the Gini coefficient. Explain their meanings. *25*

Q12. (a) The ordinary least squares estimate of β in the classical linear regression model

$$Y_i = \alpha + \beta X_i + U_i \, ; \quad i = 1, 2, ..., n$$

is $\hat{\beta} = \sum_{i=1}^{n} W_i Y_i$, where $W_i = \dfrac{x_i}{\sum_{i=1}^{n} x_i^2}$

and $x_i = X_i - \overline{X}$, $\overline{X} = \dfrac{1}{n} \sum_{i=1}^{n} X_i$.

Show that if $\mathrm{Var}(\hat{\beta}) = \dfrac{\hat{\sigma}_u^2}{\sum_{i=1}^{n} x_i^2}$, no other linear unbiased estimator of β can be constructed with a smaller variance. (All symbols have their usual meaning) *18*

(b) Consider the regression model

$$Y_i = \alpha + \beta X_i + U_i$$

where Y is the quantity demanded of bread and X is the price of butter, and U_i is a random term that is distributed normally with mean zero and unknown variance σ_u^2. A sample of 20 observations yields the following information :

$$\sum_{i=1}^{20} Y_i = 21{\cdot}9 \qquad \sum_{i=1}^{20} (Y_i - \overline{Y})^2 = 86{\cdot}9$$

$$\sum_{i=1}^{20} X_i = 186{\cdot}2 \qquad \sum_{i=1}^{20} (X_i - \overline{X})^2 = 215{\cdot}4$$

$$\sum_{i=1}^{20} (X_i - \overline{X})(Y_i - \overline{Y}) = 106{\cdot}4$$

(i) Set up the null and alternative hypotheses to test if the price of butter as a determinant of the quantity demanded of bread is significant.

(ii) How would you test your hypotheses ?

[Given that $t_{0\cdot05;\ 18} = 1\cdot734$, $t_{0\cdot01;\ 18} = 2\cdot552$, $t_{0\cdot025;\ 18} = 2\cdot101$ and $t_{0\cdot005;\ 18} = 2\cdot878$, where $0\cdot025 = \int_{t_{0\cdot025}}^{\infty} f(t)\,dt$. 7

Q13. (a) Define autocorrelation and state what are the possible sources of autocorrelation. 5

(b) Suppose that the time series data follows the auto-regressive scheme of order one, that is, AR(1). Show that an AR(1) process is simply an MA(∞) process (that is, moving average scheme of order infinity). 5

(c) Find the mean and variance if the time series data are modelled by the process

$$Y_t = a + Y_{t-1} + \varepsilon_t$$

where ε_t is a pure white noise. Find out also, the auto-correlation coefficient of s^{th} order. Interpret your results. How do you test stationarity in this case ? 15