FIFTH SEMESTER EXAMINATION-2012

ENGINEERING ECONOMICS

[HU 501]

Full Marks: 60 Time: 3 Hours

Answer any SIX questions including Question No.1 which is compulsory.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. a) If the demand for good Y increases as the price of good X rises, how are the two goods related? [2 × 10

   b) The market demand for a good at ₹4 per unit is 100 Units. The price rises as a result its demand falls to 75 units. Find out the new price if the price elasticity of demand of that good is -1.

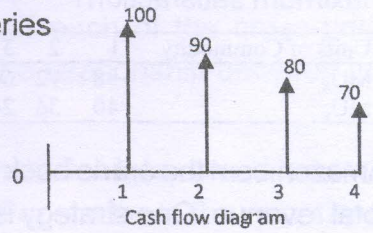
   c) A firm producing 20 units. At this level of output the AC and AVC are respectively equal to ₹40 and ₹37. Find out the total fixed cost of the firm.

   d) Write any four important causes of origin of monopoly.

   e) What do you mean by variable cash reserve ratio?

   f) Explain why the replacement of an asset is necessary.

   g) Find the Annual Equivalent amount of the following series of net cash flows at 10%.



Cash flow diagram

h) From the following table find which investment option is your exclusive choice (A, B, C or D)?

Year	A	B	C	D
0	-10	-20	-200	-1
1	15	30	215	4
PW (10%)	3.63	7.27	-4.34	2.63

i) Your uncle has almost convinced you to invest in his peach farm. It would require a $10000 initial investment on your part. He promises you revenue of $1800 at the end of every year. You are planning to invest for six years. Your uncle has promised you to buy out your share of the business at that time for $12000. You have decided to set a personal MARR of 15% per year. Find the profitability of the business by Future worth method.

j) Marginal Product of Labour in the production of computer chips is 50 chips per hour. The marginal rate of Technical substitution of hours of Labour for hours of machine capital is ¼. What is the Marginal Product of capital?

2. (a) Satish has ₹88 with him. He is interested to purchase good X and good Y with his money. The market price of good X and good Y per unit is ₹8. The marginal utility schedule of good X and good Y is given below. Find out how many units of X and Y should Satish purchase at the consumer equilibrium point so that he will get maximum satisfaction? [3

Units of Commodity	1	2	3	4	5	6	7	8	9	10
MU_x	88	72	64	56	48	40	32	24	16	8
MU_y	40	36	24	20	16	12	8	4	0	0

b) Amazon.com the online book seller wants to increase its total revenue. One strategy is to offer 10% discount on [3

every book it sells. Amazon.com knows that its customers can be divided into two distinct groups according to their likely responses to the discount. The following table shows how the two groups respond to the discount. The price elasticity of two groups are also given.

Particulars	Group-A (Sales per week)	Group-B (Sales per week)	Elasticity
Volume of sales before 10% discount	1.55 million	1.50 million	0.625
Volume of sales after 10% discount	1.65 million	1.70 million	1.25

(i) Explain how the discount will affect total revenue from each group.

(ii) Suppose Amazon.com knows which group each customer belongs to when he logs on and can choose whether or not to offer the 10% discount. If Amazon.com wants to increase its total revenue should discounts be offered to group-A, or group-B, to neither group, or to both groups?

c) Consider the following goods and their cross elasticities. [2

Goods	Cross elasticities of demand
Air conditioning units and kilowatts of electricity	-0.34
Coke and pepsi	+0.63
High fuel consuming sports-utility vehicles and gasoline	-0.28
McDonalds burgers and Burger king burgers	+0.82
Butter and Margarine	+1.54

(i) What does the sign of each of the cross-price elasticities imply about the relationship between the goods in question?

(ii) Use the information in the table to calculate how a 5% increase in price of Pepsi affects the quantity of

coke demanded.

3. a) The following is the price and quantity data for pens sold by company. [4

X	(Price in ₹)	2	1	2	4	5	4	3	8	6	5
Y	(Quantity in '000' units)	9	10	8	7	5	6	8	3	4	7

Fit a linear trend line to the data and estimate the demand for pens when the price is ₹7 per pen.

b) The following table gives total output or total product as a function of labour units used [2

Labour	0	1	2	3	4	5
Total Output	0	5	9	12	14	15

Does the above table indicate a situation of Diminishing return? Explain your answer.

c) A certain production process employs two inputs- Labour (L) and raw materials (R). Output (Q) is a function of these two inputs and is given by the following relationship [2

$$Q = 6L^2R^2 - 0.10L^3R^3$$

Assume that raw materials (R) are fixed at 10 units.

(i) Find the number of units of input L that maximizes the total product function.

(ii) Find the number of units of input L that maximizes the average product function.

4. a) An accountant for a car rental company was recently asked to report the firm's costs of producing various levels of output. The accountant knows that the most recent estimates available for the firms cost function is $C=100+10Q+Q^2$, where costs are measured in [4

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thousands of dollars and output is measured in thousands of hours rented.

(i) What is the Average Fixed Cost of producing 2 units of output?

(ii) What is the Average Variable Cost of producing 2 units of output?

(iii) What is the Marginal Costs of producing 2 units of output?

(iv) What is the Average Total Cost of producing 2 units of output?

b) Suppose you are the Manager of Alpha Enterprises - a firm that holds a patent that makes it the exclusive manufacturer of bubble memory chips. Based on the estimates provided by a consultant you know that the relevant demand and cost functions for bubble memory chips are; $Q = 25–5P$ and $C = 50+2Q$ [2

(i) What is the firm's marginal revenue when producing 4 units of output?

(ii) What are the levels of output and price when you are maximizing the profit?

c) You are operating in a perfectly competitive market. The Price in your market is ₹35. The total cost curve is $C=10+2Q+0.5Q^2$. [2

(i) What level of output should you produce in the short run?

(ii) Will you make any profit in the short run?

5. a) Ann Culinan is hired as a Consultant to firm producing ball bearings. The firm sells in two different markets, one of which is completely sealed off from the other. The demand curve for the firm's output in the one [4

market is $P_1 = 160 - 8Q_1$ where P_1 is the Price of the product and Q_1 is the amount sold in the first market. The demand curve for the firm's product in the second market is $P_2 = 80 - 2Q_2$ where P_2 and Q_2 are the price and quantity sold in the second market. The firm's marginal cost is MC = 5 + Q, where Q is the firm's entire output. Answer the following questions asked by the firm to Ann Culinan.

(i) How many units of output should the firm sell in the second market?

(ii) How many units of output should it sell in the first market?

(iii) What price should it fix in each market?

b) Seeing the need for child care in her community, Sue decided to launch her own day care service. Her service needed to be affordable, so she decided to watch each child for ₹12 a day. After doing her homework, Sue came up with the following financial information. [2

Selling Price (per child per day) = ₹12
Fixed Expenses (per month) = ₹600
Variable expenses per child = ₹4
towards snacks, breakfast and lunch

The month of June has 20 working days, Monday through Friday for four weeks. How many children will Sue need to take care of just to break-even in her new business? How many kids Sue must take care of at least per day?

c) The margin of safety of a company is 40% of sales. The sales volume is ₹50,00,000. Find the break-even sales. If P/V ratio is 50%, find the fixed cost. [2

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6. a) A project will produce cash inflows of ₹1750 a year for four years. The project initially costs ₹10600 to get started. In year five the project will be closed and as a result should produce a cash inflow of ₹8500. What is the Net Present Value of this project if the required rate of return is 13.75 percent compounded annually? [4

b) An investment of $136000 yields the following cash inflows. Determine the internal rate of return. [4

Year	1	2	3	4	5
Cash inflows, $	30000	40000	60000	30000	20000

7. a) A government bridge project requires an initial investment of ₹10 million and operating and maintenance cost of ₹2,50,000 per year for 20 years life of the project. The annual user benefits of ₹20,00,000 per year are estimated to arise from savings in travel distance and time. If interest rate is 7 percent, determine whether the project is worth taking up or not (Use B/C ratio method). [3

b) John Bros acquired a machine on 1st January 2010 at a cost of $14000 and spent $1000 on its installation. The firm writes off the depreciation at 20% every year. The salvage value of the machine is $5000 at the end of 5 years. The books are closed on 31st December every year. Calculate depreciation of the asset by declining balance method. [3

c) While in college Ellen received $10000 in student loans at 5% interest. She will graduate in June and is expected to begin repaying the loans in either 5 or 10 equal annual payments. Compute her yearly payments for both repayment plans. [2

8. a) Cindy and Mindy were in the same student group while studying for their MBA. They completed MBA together but started working as inventory Manager in different but competing companies selling air conditioner. While in school, they learnt only the economic order quantity model for finding the optimal order sizes. Now they are both purchasing air conditioner to sell at their stores. Cindy knows that the ordering cost ₹200 and the annual inventory carrying cost is ₹400. Cindy expects that Mindy has the same cost figures. Cindy has accidentally learnt that Mindy is ordering 10 airconditioner every time she orders. Show how Cindy can use this information to deduce the annual demand Mindy faces. [3

b) What do you mean by inflation? Explain the quantitative methods to control inflation. [5

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