NAME OF THE COURSE: B COM. H. SEM IV

SCHEME/MODE OF EXAMINATION: CBCS (OPEN BOOK)

NAME 0F THE PAPER: BCH 4.2: BUSINESS MATHEMATICS

UNIQUE PAPER CODE: 22411402

DURATION: 2 HOURS

MAXIMUM MARKS: 75

NOTE: ANSWER MAY BE WRITTEN IN ENGLISH OR IN HINDI; BUT SAME MEDIUM SHOULD BE USED THROUGHOUT THE PAPER.

ATTEMPT ANY FOUR QUESTIONS, ALL QUESTIONS CARRY EQUAL MARKS.

Q1) The following table gives the technology matrix for a two-sector economy:

	Sector 1	**sector 2**
Sector 1	0.5	0.3
Sector 2	0.3	0.2
Labour	0.5	0.4

Final demand for the two sectors is 15 units and 20 units respectively.

(i) Write down the input-output table for the economy.

(ii) If the total labour available is 20 units, is the solution feasible?

(iii) Also find the equilibrium prices if the wage rate is ₹ 50 per man day.

Q2) Given below is a simplex tableau for a maximisation linear programming problem:

		C_j	4	5	8	0	0	0
C_j	Basic variable	solution/value	x_1	x_2	x_3	S_1	S_2	S_3
5	x_2	10	0	1	3/5	0	1	0
4	x_1	5	1	0	20/4	0	-1	0
0	S_1	20	0	0	-1/5	1	0	1

Complete the above table and answer the following questions with reasons:

(i) Is the solution optimal?
(ii) Is this solution feasible?
(iii) Does the problem have multiple optimal solutions? If so, show one such solution.
(iv) Which of the resource(s) is being used to the full capacity?
(v) Which of the resource(s) has excess or spare capacity?
(vi) If a customer is prepared to pay higher prices for product x_3 how much should the price be increased so that it is produced?
(vii) Indicate whether the solution given in the table is degenerate. If yes, which variable is degenerated?

Q3) A monopolist has the following demand and average cost functions: $p = 50 - x/3$ and $AC = 0.5 + 10 + 400/x$ where p is price and x is quantity.
(i) Find what is elasticity of demand when p = 30.
(ii) Determine the level of output at which profit will be maximum.
(iii) At that level of output, prove that elasticity of average cost is equal to elasticity of total cost minus one.

Q4) A production function is given by $Q = 45 L^{1/3}k^{2/3}$, where L is labour and K is capital.
(i) Find the behaviour of the marginal product of each factor.

(ii) What is the nature of returns to scale?
(iii) What is the total reward of labour and capital if each factor is paid a price equal to its marginal product?

Q5) A firm is considering buying an energy saving device which will reduce its consumption of electricity. The device will cost ₹ 90,000. Engineering estimates suggest that the savings from using device will occur at the rate of ₹ S(t) per year. $S(t) = 5000t^{1/2}$, $0 \leq t \leq 15$ and t is the time in year.
(i) Find the cumulative savings at the end of 4 years.
(ii) What are the total savings in the fourth year?
(iii) Also determine how long it will take for the firm to recover the cost of device.

Q6) Mr X purchased a house for ₹ 5,00,000. He agrees to pay for the house in 10 equal instalments at the end of each year. If money worths 8% effective. What would be the size of each instalment?
(i) If instalment is paid at the end of each year.
(ii) If instalment is paid in the beginning of each year.
(iii) if the first instalment to begin after three years from now.
(iv) What happens in above three cases, if Mr X makes a down payment of ₹ 1,00,000.