

**DEPARTMENT OF MANAGEMENT
SCHOOL OF MANAGEMENT & BUSINESS STUDIES
JAMIA HAMDARD**

Even Semester Examination (Online Examination) August 2021

B.Com (Hons)- [II-Semester]

Subject Name: Business Mathematics

MM: 75

Subject Code: BCH203

Time: 03Hours

Email Id of the Examiner: superrmaths@gmail.com

Email Id of the Assistant Superintendent of Exams: bcomhons2ndsemaugust2021@gmail.com

Email Id of Dean: deanmanagement@jamiahamdard.ac.in

Note:

- Students have to submit the **Scannedhand written solution** to the Examiner, Assistant Superintendent of Examination and Dean on the email ids as mentioned above.
- Students shall use **ruled white paper & blue ink** to write the solution. Each page must have a **serial number and the signature** of the student.
- An additional $\frac{1}{2}$ an hour will be given to the examinees to scan the answer sheets, convert it into single PDF and upload it on the id's given on the question papers.
- If any two copies are found to be similar then both the copies shall be cancelled. Such students will be considered/ tried for unfair means.
- The attached PDF shall be named as follows –
Roll No- Full Name-Enrollment Number-Course-Semester-Subject Abbreviation(Example: 20334032-Rabia Shaheen-2020-334-032-BCH-II-MPP)and students shall also mention the same in subject line of the email& his/her answer copy also.
- Answer All Questions, each carry equal marks.

1(a). Suppose the inter - industry flow of the products of two industries are given as under:

Production sector	Consumption sector	Domestic Demand	Total output
	X	Y	
X	30	40	50
			120

Y 20 10 30 60

(i) Determine the technology matrix and test Simon Hawkins conditions for the viability of the system.

(ii) If the domestic demand changes to 80 and 40 units respectively, what should be the gross output of each sector in order to meet the new demands.

1 (b). A firm produces two products P_1 and P_2 passing through two machines M_1 and M_2 before completion. M_1 can produce either 10 units of P_1 or 15 units of P_2 per hour. M_2 can produce 15 units of either product per hour. Find daily production of P_1 and P_2 if time available is 12 hours on machine M_1 and 10 hours on machine M_2 per day using matrix inversion.

OR

A company earns before tax profits of Rs 1,00,000. It is committed to making a donation to the red Cross 10% of its after tax profits. The central government levies corporate taxes of 50% of profits after deducting charitable donation and any local taxes. The company must also pay local taxes of 10% of its profits less the donation to the Red Cross, using Cramer's rule.

2 (a). An indifference map is defined by the relation

$$(x + h)\sqrt{y + k} = a,$$

Where h and k are fixed positive numbers and a is a positive parameter. By expressing y as a function of x and finding derivatives show that each indifference curve is downward sloping and convex from below.

2(b). A profit making company wants to launch a new product. It observes that the fixed cost of the new product is Rs.35,000 and the variable cost per unit is Rs. 500. The revenue function for the sale of x units is given by $5000x - 100x^2$. Find (i) profit function, (ii) Break-even values, and (iii) the values of x that result in a loss.

OR

The cost of producing x units is given as

$$C(x) = 0.001x^3 - 0.3x^2 + 30x + 42$$

Determine where the cost function is concave up and where it is concave down. Also find the inflection point.

3(a). A product function is given by

$$Q = F(L, K) = 27L^{2/3}K^{1/3}.$$

Where L is units of labour and K is units of capital.

- (i) Find the behaviour of marginal product of each factor.
- (ii) What is the nature of returns to scale?

3(b). The marginal cost function of manufacturing x pair of shoes is $6+10x-6x^2$. The total cost of producing a pair of shoes is Rs. 12. Find the total average cost function.

OR

A firm's marginal revenue function is $MR = 20e^{-x/10}(1 - \frac{x}{10})$. Find the corresponding demand function.

4(a). How long will it take Rs.1200 to amount to Rs.2000 at 5% converted quarterly?

4(b). The amount of Re.1 in 2 years at a certain nominal rate of interest plus the present value of Re. 1 due in 2 years, at the same nominal rate of discount, both rate convertible half-yearly, is 2.0080032. find the rate of discount.

OR

An asset costing Rs. 2000 will depreciate to a scrap value of Rs.160 in 10 years. Find the rate of depreciation.

5(a). Solve graphically:

$$\text{Maximise } Z = 10x + 6y$$

Subject to

$$3x + y \leq 12$$

$$2x + 5y \leq 34$$

$$x, y \geq 0$$

5(b). Solve by Simplex Method

$$\text{Maximise } Z = 20x + 30y$$

Subject to

$$3x + 3y \leq 36$$

$$5x + 2y \leq 50$$

$$2x + 6y \leq 60$$

$$x, y \geq 0$$

OR

Two materials A and B are required to construct tables and book cases. For one table 12 units of A and 16 units of B are needed while for a book case 16 units of A and 8 units of B are required. The profit on a book case is Rs. 25 and Rs.20 on a table. 100 units of material A and 80 units of B are available. How many book cases and tables be produced to have maximum profit? Formulate this as a linear programming problem and solve by simplex method.