BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER: I**
BRANCH: QEDS **SESSION: MO/2022**

SUBJECT: ED105 FUNDAMENTALS OF ECONOMICS WITH NECESSARY MATHEMATICS

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Represent the system of linear equations as Ax=b, where A is a matrix and x and b are vectors of appropriate dimensions. $-x_1 + 3x_2 + 2x_3 = 24$ $x_1 + x_3 = 6$ $5x_2 - x_3 = 8$	[2]	1	
Q.1(b)	Solve the above system of linear equations using matrix method.	[3]	1	
Q.2(a)	Use Cramer's rule to solve the market model for equilibrium price and quantity: Demand Equation: Q= a-dP Supply Equation: Q=-c+dP	[2]	1	
Q.2(b)	Use Jacobian determinants to test the existence of functional dependence between the paired functions. $Y_1 = 3x_1^2 + x_2$ $Y_2 = 9x_1^4 + 6x_1^2 (x2 + 4) + x_2 (x_2 + 8) + 12$	[3]	1	
Q.3(a)	Given $x^2+3xy+2yz+y^2+z^2-8=0$, is an implicit function y=f(x,z) defined around the point (x=1, y=1,z=1)? If so, find $\delta y/\delta x$ and $\delta y/\delta z$ by the implicit function rule, and evaluate them at that point.	[2]	1	
Q.3(b)	Which of the following quadratic functions are strictly convex? (a) $y=9x^2-4x+8$; (b) $w=-3x^2+39$; (c) $u=9-2x^2$; (d) $v=8-5x+x^2$	[3]	2	
Q.4(a)	Express the quadratic form as a matrix product involving a symmetric coefficient matrix: $q=3u^2-4uv+7v^2$	[2]	2	
Q.4(b)	The demand functions for 2 commodities x and y are: $P_1=8-2x$ and $P_2=14-y^2$. The cost function is C=10+4x +2y. Determine the quantities that maximize the profit of the monopolist and find the maximum profit.	[3]	2	
Q.5	Take the utility function as $U=q_1^{0.3} q_2^{0.7}$. The budget equation is $5q_1+4q_2=100$. Find the optimum purchase of 2 commodities using constrained optimization.	[5]	2	

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