Doon University, Dehradun
Final Semester Examination, 2016
School of Social Sciences
Msc Semester – II (Economics)
Course – SSE - 152
Mathematical Methods in Economics II

Time Allowed: 3hrs	Maximum Marks: 50

Instructions:
Section A consists of 7 questions of 2 marks each. All are compulsory.
Section B consists of 4 questions of 5 marks each. All are compulsory.
Section C consists of 3 questions of 8 marks each. Attempt any 2 out of them.

Section – A   (2x7=14 marks)

1. In real world, when a consumer maximizes his utility, there are some constraints. In this context explain the notation of **max(x,y) subject to px + y = m,** Where x and y are goods for the consumer.

2. Find the maximum point(value of variables x and y) for the following function
$$F(x,y) = -2x^2 - 2xy - 2y^2 + 36x + 42y - 158$$

3. Define a vector. What are the different types of vectors?

4. If $A = \begin{vmatrix} 1 & 2 & 0 \\ 4 & -3 & -1 \end{vmatrix}$ and $B = \begin{vmatrix} 0 & 1 & 2 \\ 1 & 0 & 2 \end{vmatrix}$, compute A + B, 3A and -1/2*B

5. In the previous question, also find |A| and |B|

6. Let a = (1, 2, 2) and b = (0, 0, -3) and c = (-2, 4, -3) then find a + b + c and a - 2b + 2c.

7. State the two methods to find out whether a function is convex or concave?

Section – B   (5x4 = 20marks)

1. Check the convexity/concavity of the following functions:
   (a) $f(x) = x^2 - 2x + 2$
   (b) $f(x) = ax^2 + bx + c$
   (c) $Y = Ak^a$ defined for all $K \geq 0$.
   $(A > 0, a > 0)$

2. Answer the following questions
   a. If a = (1, −2, 3) and b = (−3, 2, 5), compute a. b.
   b. If 3(x, y, z) + 5(−1, 2, 3) = (4, 1, 3), find x, y, and z.

3. Show the following vector representations graphically
   a. a + b
   b. a − b

4. For what values of x is the inner product of $(x, x − 1, 3)$ and $(x, x, 3x)$ equal to 0?

Section – C   **(2x8 = 16marks)**

1. A consumer who has Cobb–Douglas utility function $U(x, y) = Ax^a y^b$ faces the budget constraint $px + qy = m$, where A, a, b, p, q, and m are all positive constants. Find the only solution candidate to the consumer demand problem: **max $Ax^a y^b$**
                                subject to
                                px + qy = m

2. A firm has three factories each producing the same item. Let x, y, and z denote the respective output quantities that the three factories produce in order to fulfil an order for 2000 units in total. Hence, **x + y + z = 2000**. The cost functions for the three factories are
$C_1(x) = 200 + 1/100*x^2$
$C_2(y) = 200 + y + 1/300*y^3$
$C_3(z) = 200 + 10z$
The total cost of fulfilling the order is thus
$C(x, y, z) = C_1(x) + C_2(y) + C_3(z)$
Find the values of x, y, and z that minimize C

3. Answer the following:
(i)
(a) If $x + 0 = 0$, what do you know about the components of x?
(b) If $0x = 0$, what do you know about the components of x?
(ii) Find the inverse of the matrix $A = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$ when it exists ($|A|$ is not zero).

(iii) Integrate $\int 1/\sqrt{x}$ and $\int 5x^2$
(iv) Find the solution:
   Maximize xy subject to $2x + y = 100$