* U A - 3 5 0 6 *

UA-3506

First Year B. B. A. (Sem. I) (CBCS) Examination

March/April – 2012

Quantitative Methods : Paper - I

(Mathematics Oriented)

Time : Hours] [Total Marks : **70**

Instruction :

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **F. Y. B. B. A. (Sem. 1) (CBCS)**

Name of the Subject :

☛ **Quantitative Methods - 1**

☛ Subject Code No. : **3 5 0 6** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

1 Answer the following : **10**

(1) Evaluate $\begin{vmatrix} x+y & x \\ x & x-y \end{vmatrix}$.

(2) If $A = \begin{bmatrix} 3 & 6 \\ 9 & 12 \\ -15 & 18 \end{bmatrix}$ then find the matrix B such that

$2A^T + 3B = 0$.

(3) Define unbounded solution.

(4) Using North-West corner rule find initial basic feasible solution of following transportation problem :

10	8	6	3
3	2	1	5
9	4	3	7
5	5	5	

(5) Find IBFS for the following assignment problem

3	1	2
9	2	1
3	5	6

2 (a) In a shop of electronic items TVs, desk-tops, Laptops and cord-less phone of three brands X, Y and Z are displayed. The total number of each product and brand is given below. The cost price of individual item in rupees are also shown in other matrix. Find the total cost of the stock company wise in the shop using matrix : **6**

	Quantity (Number)			
Company	*TV*	*Desk – top*	*Laptop*	*Phone*
X	5	3	4	2
Y	0	4	2	3
Z	1	0	6	2

Item	Cost Price (Rs.)
TV	150
Desk-top	2000
Lap top	1200
Phone	400

(b) Solve the following system of equations by matrix inversion method : **6**

$$x+y+z=3$$
$$2x-y-z=3$$
$$x-y+z=9$$

OR

2 (a) Let $A=B+C$, where B is a symmetric matrix and C is a skew symmetric matrix : **6**

If $A=\begin{bmatrix} 2 & 4 & 6 \\ 8 & 10 & 12 \\ 14 & 16 & 18 \end{bmatrix}$ then find B and C.

(b) If $A=\begin{bmatrix}1 & -1\\ 2 & -1\end{bmatrix}, B=\begin{bmatrix}a & 1\\ b & -1\end{bmatrix}$ and $(A+B)^2 = A^2+B^2$ then **3**

find a and b.

(c) If $\begin{bmatrix}1 & 2 & 3\\ 3 & 1 & 2\\ 2 & 3 & 1\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix} = \begin{bmatrix}4 & -2\\ 0 & -6\\ -1 & 2\end{bmatrix}\begin{bmatrix}2\\ 1\end{bmatrix}$ then find the value **3**

of x, y and z by inverse matrix method.

3 (a) Solve the following system of equation by Cramer's Rule : **6**

$$2x-3y+z=5$$
$$3x+4y-2z=21$$
$$x-y+3z=6$$

(b) Using properties of determinant prove that **6**

$$\begin{vmatrix} la+l & ma & l-ma\\ ma+m & nb & m-nb\\ na+n & lc & n-lc\end{vmatrix}=0$$

OR

3 (a) Solve the following system of equation by Cramer's Rule : **6**

$$4x+3z=2$$
$$-x+5z=1$$
$$2x+3y=-1$$

(b) Using properties of determinant prove that **6**

$$\begin{vmatrix} a+b & c & c-a\\ b+c & a & a-b\\ c+a & b & b-c\end{vmatrix}=a^2+b^3+c^3-3abc$$

4 (a) A firm makes two products X and Y, and has a total production capacity of 9 tonnes per day, X and Y requiring the same production capacity. The firm has a permanent contract to supply at least 2 tonnes of X and at least 3 tonnes of Y per day to another company. Each tonne of X requires 20 machine hours of production time and each tonne of Y requires 50 machine hours of production time. The daily maximum possible number of machine hours is 360. All the firm's output can be sold, and the profit made is Rs. 80 per tonne of X and Rs. 120 per tonne of Y. It is required to determine the production schedule for maximum profit and to calculate this profit. Use graphical method. **6**

(b) Using graphical method find the optimum solution for following linear programming problem : **6**

Maximize $Z = 2x_1 + 3x_2$

Sub to $x_1 + x_2 \leq 30$

Constraints $x_1 - x_2 \geq 0$

$x_2 \geq 3,\ x_2 \leq 12,\ x_1 \leq 20$

with non negative $x_1, x_2 \geq 0$

restriction

OR

4 (a) The standard weight of a special purpose brick is 5 kg. and it contains two basic ingredients B_1 and B_2. B_1 costs Rs. 5 per kg and B_2 costs Rs. 8 per kg. Strength consideration dictate that the brick should contain not more than 4 kg of B_1 and a minimum of 2 kg. of B_2. Since the demand for the product is likely to be related to the price of the brick. Find out graphically the minimum cost of the brick satisfying the above conditions. **6**

(b) Using graphical method find the optimum solution for following linear programming problem : **6**

Maximum $Z = 50x_1 + 30x_2$

Sub. to $2x_1 + x_2 \geq 18$

Constraints $x_1 + x_2 \geq 12$

$3x_1 + 2x_2 \leq 34$

with non negative restriction $x_1, x_2 \geq 0$

5 Attempt any two : **12**

(a) Using Vogel's approximation method find Initial basic feasible solution for following transportation problem :

	A	*B*	*C*	*D*	*Supply*
X	11	13	17	14	250
Y	16	18	14	10	300
Z	21	24	13	10	400
Demand	200	225	275	250	

(b) Find optimum solution for the following transportation problem :

	a	*b*	*c*	*d*	
A	8	9	6	3	18
B	6	11	5	10	20
C	3	8	7	9	18
	15	16	12	13	

(c) Consider the following transportation problem find the optimum solution for this transportation problem :

	D	*E*	*F*	*G*	
A	19	30	50	10	7
B	70	30	40	60	9
C	40	8	70	20	18
	5	8	7	14	

6 Attempt any two : **12**

(a) A methods engineer wants to assign four new methods to three work centres. The assignment of the new methods will increase production and they are given below. If only one method can be assigned to a work centre, determine optimum solutions :

Centre / *Method*	*A*	*B*	*C*
1	10	7	8
2	8	9	7
3	7	12	6
4	10	10	8

(b) A head of department in a college has the problem of assigning courses 70 teachers with a view to maximizing education quality in his department. He has available 40 him one professor two associate professor and one assistant professor. Four courses must be offered and after appropriate evaluation, he has arrived at the following relative ratings (100 = best) regarding the ability of each instructor to teach each of the four courses :

	Course 1	Course 2	Course 3	Course 4
Prof. 1	60	40	60	70
Prof. 2	20	60	50	70
Prof. 3	20	30	40	60
Prof. 4	30	10	20	40

How should he assign his staff to the courses to realise his objective ?

(c)

	1	2	3	4	5
A	25	55	60	45	30
B	45	65	55	35	40
C	10	35	45	55	65
D	40	30	70	40	60
E	55	45	40	55	10

Find optimum solution for above assignment problem.
