BRAINWARE UNIVERSITY
Term End Examination 2020 - 21
Programme – Bachelor of Computer Applications
Course Name – Mathematics - III
Course Code - BCA304
Semester / Year - Semester III

Time allotted : 85 Minutes Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 70=70

1. *(Answer any Seventy)*

(i) A shop can make two types of sweets (A and B). They use two resources – flour and sugar. To make one packet of A, they need 2 kg of flour and 5 kg of sugar. To make one packet of B, they need 3 kg of flour and 3 kg of sugar. They have 25 kg of flour and 28 kg of sugar. These sweets are sold at Rs 800 and 900 per packet respectively. Find the best product mix The number of decision variables is ______________

a) 1 b) 2
c) 3 d) 4

(ii) A company makes two products (A and B) and both require processing on 2 machines. Product A takes 10 and 15 minutes on the two machines per unit and product B takes 22 and 18 minutes per unit on the two machines. Both the machines are available for 2640 minutes per week. The products are sold for Rs 200 and Rs 175 respectively per unit. Formulate a LP to maximize revenue? The market can take a maximum of 150 units of product . An appropriate objective function for this problem is to

a) Maximize total revenue b) Minimize total cost
c) Maximize the total units of products produced. d) None of these

(iii) An investor has Rs 20 lakhs with her and considers three schemes to invest the money for one year.The expected returns are 10%, 12% and 15% for the three schemes per year. The third scheme accepts only up to 10 lakhs. The investor wants to invest more money in scheme 1 than in scheme 2.The investor assesses the risk associated with the three schemes as 0 units, 10 units and 20 units per lakh invested and does not want her risk to exceed 500 units How many decision variables are in your formulation?.

a) 1 b) 2

c) 3 d) 4

(iv) An investor has Rs 20 lakhs with her and considers three schemes to invest the money for one year.The expected returns are 10%, 12% and 15% for the three schemes per year. The third scheme accepts only up to 10 lakhs. The investor wants to invest more money in scheme 1 than in scheme 2.The investor assesses the risk associated with the three schemes as 0 units, 10 units and 20 units per lakh invested and does not want her risk to exceed 500 units. How many constraints are in your formulation?

a) 2 b) 3

c) 4 d) 5

(v) Two tasks have to be completed and require 10 hours and 12 hours of work if one person does the tasks. If n people do task 1, the time to complete the task becomes 10/n and so on. Similarly if n people do task 2, the time becomes 12/n and so on. We have 5 people and they have to be assigned to the two tasks. We cannot assign more than three to task 1. Find the earliest time that both tasks are completed if they start at the same time. (Use ideas from the bicycle problem to write your objective function. At some point you may have to define a variable to represent the reciprocal of another variable). Formulate an LP problem and answer the following: The final objective function is

a) Maximization problem with one term in the objective function

b) Minimization problem with one term in the objective function

c) Maximization problem with two terms in the objective function

d) Minimization problem with two terms in the objective function

(vi) TV sets are to be transported from three factories to three retail stores. The available quantities are 300, 400 and 500 respectively in the three factories and the requirements are 250, 350 and 500 in the three stores. They are first transported from the factories to warehouses and then sent to the retail stores. There are two warehouses and their capacities are 600 and 700 units. The unit costs of transportation from the factories to warehouses and from the warehouses to retail stores are known. Formulate an LP and answer the following questions: The objective function

a) Maximizes the total cost of transportation between factories and warehouses and between warehouses and retail stores

b) Maximizes the total quantity transported between factories and warehouses and between warehouses and retail stores

c) Minimizes the total cost of transportation between factories and warehouses and between warehouses and retail stores

d) Minimizes the total quantity transported between factories and warehouses and between warehouses and retail stores

(vii) TV sets are to be transported from three factories to three retail stores. The available quantities are 300, 400 and 500 respectively in the three factories and the requirements are 250, 350 and 500 in the three stores. They are first transported from the factories to warehouses and then sent to the retail stores. There are two warehouses and their capacities are 600 and 700 units. The unit costs of transportation from the factories to warehouses and from the warehouses to retail stores are known. Formulate an LP and answer the following questions: The number of terms in the objective function is

a) 6

b) 8

c) 12

d) 18

(viii) TV sets are to be transported from three factories to three retail stores. The available quantities are 300, 400 and 500 respectively in the three factories and the requirements are 250, 350 and 500 in the three stores. They are first transported from the factories to warehouses and then sent to the retail stores. There are two warehouses and their capacities are 600 and 700 units. The unit costs of transportation from the factories to warehouses and from the warehouses to retail stores are known. Formulate an LP and answer the following questions: The number of decision variables in the formulation is

a) 8

b) 10

c) 12

d) 18

(ix) Thousand answer papers have to be totaled in four hours. There are 10 regular teachers, 5 staff and 4 retired teachers who can do the job. Regular teachers can total 20 papers in an hour; staff can do 15 per hour while retired teachers can do 18 per hour. The regular teachers total the papers correctly 98% of the times while this number is 94% and 96% for staff and retired teachers. We have to use the services of at least one staff. You can assume that any person can work for a fraction of an hour also. Formulate a relevant LP problem and answer the following questions. Which of the following is a correct decision variable for this problem

a) Number of answer papers given to teachers 1 to 10

b) Total number of answer papers given to regular teachers

c) Number of papers correctly totaled by regular teachers

d) Number of papers incorrectly totaled by the reg

(x) Thousand answer papers have to be totaled in four hours. There are 10 regular teachers, 5 staff and 4 retired teachers who can do the job. Regular teachers can total 20 papers in an hour; staff can do 15 per hour while retired teachers can do 18 per hour. The regular teachers total the papers correctly 98% of the times while this number is 94% and 96% for staff and retired teachers. We have to use the services of at least one staff. You can assume that any person can work for a fraction of an hour also. Formulate a relevant LP problem and answer the following questions. The number of constraints in the formulation is

a) 5

b) 10

c) 19

d) 20

(xi) A person is in the business of buying and selling items. He has 10 units in stock and plans for the next three periods. He can buy the item at the rate of Rs 50, 55 and 58 at the beginning of periods 1, 2 and 3 and can sell them at Rs 60, 64 and 66 at the end of the three periods. He can use the money earned by selling at the end of the period to buy items at the beginning of the next period. He can buy a maximum of 200 per period. He can borrow money at the rate of 2% per period at the beginning of each period. He can borrow a maximum of Rs 8000 per period and he cannot borrow more than Rs 20000 in total. He has to pay back all the loans with interest at the end of the third period. What is the correct objective function for this problem? How many decision variables are in the formulation

a) 3 b) 6

c) 9 d) 10

(xii) A food stall sells idlis, dosas and poories. A plate of idli has 2 pieces, a plate of dosa has 1 piece while a plate of poori has 2 pieces. They also sell a "combo" which has 2 idlis and 2 poories. A kg of batter costs Rs 60 and contains twelve spoons of batter. Each piece of idli requires 1 spoon of batter and each dosa requires 1.5 spoons of batter. Each poori piece requires 1 ball of wheat dough and a kg of wheat dough that costs Rs 60 can make 20 balls of dough. The selling prices of the items are Rs 40,60, 60 and 90 per plate respectively. The owner has Rs 800 with her and estimates the demand for the four items (in plates) as 50, 30, 20 and 10 respectively. There is a penalty cost of Rs 10 for any unmet plate of demand of an item. Idli being the most commonly consumed item, the owner wishes to meet at least 80% of the demand. Formulate an LP problem and answer the following questions: How many decision variables are in the formulation

a) 3 b) 4

c) 5 d) 8

(xiii) Consider the maximum flow problem with n nodes and m arcs. You are writing a formulation with f as the maximum flow. The objective function has ___________ terms

a) 1 b) 2

c) 3 d) 4

(xiv) Consider the maximum flow problem with n nodes and m arcs. You are writing a formulation with f as the maximum flow. The total number of variables is ___________

a) m+1 b) n+1

c) m+n+1 d) m.n+1

(xv) Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known. The objective function has ____________ terms

a) 54 b) 55

c) 56 d) 57

(xvi) Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known. The total number of constraints relating to the laundries is ____________

a) 12 b) 14

c) 16 d) 18

(xvii) Consider the napkins problem where the requirement is for 20 days. There are two types of laundries – fast and slow. The fast laundry takes 2 days (napkins sent at the end of day 1 can be used on day 3) and the slow laundry takes 3 days (napkins sent at the end of day 1 can be used on day 4).The costs of the new napkins and the two laundries are known. The constraint to meet the demand of day 10 will have ___________ terms

a) 20 b) 25

c) 30 d) 35

(xviii) Consider the media selection problem with n possible things to invest in. Examples could be TV, radio, newspaper etc. There is a total budget restriction and limit on investment in each. The number of decision variables is

____

a) n-1 b) n-2

c) n d) n+1

(xix) Consider the LP problem: Maximize 7X1 + 6X2 subject to X1 + X2 ? 4 2X1 + X2 ? 6 X1,X2 ? 0 The objective function corresponding to the optimum solution is…………..

a) 24 b) 26

c) 28 d) 30

(xx) Consider the LP problem: Maximize 5X1 + 8X2 subject to 3X1 + 4X2 ? 12 5X1 + 2X2 ?20 X1, X2 ? 0. The objective function corresponding to the optimum solution is _______

a) 24 b) 26

c) 30 d) 36

(xxi) Consider the LP problem: Maximize 5X1 + 8X2 subject to 3X1 + 4X2 ? 16 5X1+2X2?12 X1, X2 ? 0 The corner point obtained by solving 3X1+4X2=16 and 5X1+2X2=12 is

a) (8/7, 22/7) b) (7/8, 22/7)

c) (8/7, 7/22) d) (7/8, 7/22)

(xxii) Consider the LP problem: Maximize 5X1 + 8X2 subject to 2X1 + 3X2 ? 8 2X1 + 3X2 ? -1 X1, X2 ? 0. The corner point that gives the optimum solution is

a) (0,8/3) b) (8/3,0)

c) (0,3/8) d) (3/8,0)

(xxiii) Consider the LP problem: Maximize 5X1 + 8X2 subject to 2X1 + 3X2 ? 8 2X1 + 3X2 ? -1 X1, X2 ? 0. Which of the following is true

a) The LP is unbounded b) The LP is infeasible

c) The corner point (0,0) is optimum d) The corner point (4,0) is optimum

(xxiv) Consider the LP problem: Minimize 2X1 - 3X2 subject to X1 + X2 ? 4 2X1 + X2 ? 2 X1 +2X2 ? 6 X1, X2 ? 0. The objective function value at optimum is ____

a) -7 b) -9
c) 7 d) 9

(xxv) Consider the LP problem: Maximize 7X1 + 6X2 subject to X1 + X2 ? 4 2X1 + X2 ? 6 X1, X2 ? 0. Solve by algebraic method and answer the following: The number of basic solutions is ________

a) 1 b) 4
c) 2 d) 6

(xxvi) Consider the LP problem: Maximize 7X1 + 6X2 subject to X1 + X2 ? 4 2X1 + X2 ? 6 X1, X2 ? 0. Solve by algebraic method and answer the following: If we solve for X1 and X3 as basic and the other variables as non-basic, the value of X2 is ___________

a) 0 b) 1
c) 2 d) 4

(xxvii) Consider the LP problem: Maximize 7X1 + 6X2 subject to X1 + X2 ? 4 2X1 + X2 ? 6 X1, X2 ? 0. Solve by algebraic method and answer the following: If we solve for X2 and X3 as basic and the other variables as non-basic, the value of X3 is ___________

a) 0 b) 2
c) -2 d) 1

(xxviii) Consider the LP problem: Maximize 7X1 + 6X2 + 4X3 subject to X1 + X2 + X3 ? 5 2X1 + X2 + 3X3? 10 X1, X2, X3 ? 0. Solve by algebraic method and answer the following: The number of unique basic feasible solutions is ___________

a) 3 b) 4
c) 5 d) 6

(xxix) Consider the LP problem: Maximize 7X1 + 6X2 + 4X3 subject to X1 + X2 + X3 ? 5 2X1 + X2 + 3X3? 10 X1, X2, X3 ? 0. Solve by algebraic method and answer the following: The optimum solution has X1 = ________

a) 2 b) 5
c) 6 d) 8

(xxx) If a primal constraint is an equation, the corresponding dual variable is

a) bounded b) unbounded
c) unrestricted d) none of these

(xxxi) In the optimum solution, if a primal constraint is satisfied as an equation, the value of the corresponding dual variable is ___

a) Positive b) Negative
c) Zero d) Can’t be said.

(xxxii) In the optimum solution, if a primal variable is basic then the corresponding dual slack value is ___

a) Positive b) Negative
c) Zero d) Can’t be said.

(xxxiii) If the primal (maximization) is unbounded the corresponding dual is ________

a) Bounded b) unbounded
c) infeasible d) none of these

(xxxiv) If the primal (maximization) has an objective function value of 100 at the optimum, which of the following is TRUE

a) Dual has an objective function value greater than 100 at optimum
b) Dual has an objective function value lesser than 100 at optimum
c) Dual has an objective function value equal to 100 at optimum
d) Dual’s objective function value at optimum does not depend on the objective function value of the primal

(xxxv) In a m x n balanced transportation problem the number of allocations in a non-degenerate basic feasible solution is

a) m
b) n
c) mn
d) m+n-1

(xxxvi) A transportation problem has a feasible solution when

a) all of the improvement indexes are positive
b) all the squares are used
c) the solution yields the lowest possible cost
d) all demand and supply constraints are satisfied

(xxxvii) When the number of shipments in a feasible solution is less than the number of rows plus the number of columns minus one

a) the solution is optimal
b) there is degeneracy, and an artificial allocation must be created
c) a dummy source must be created
d) a dummy destination must be created

(xxxviii) In a minimization problem, a negative improvement index in a cell indicates that the

a) solution is optimal
b) total cost will increase if units are reallocated to that cell
c) total cost will decrease if units are reallocated to that cell
d) current iteration is worse than the previous one

(xxxix) When dealing with assignment problems in which we are assigning people to activities based on the cost, what is the Hungarian Algorithm used for?

a) To minimize cost
b) To maximize cost
c) To assign all of the activities to just one person
d) To find more people that we can assign activities to

(xl) How many feasible solutions does a 5 x 5 assignment problem have?

a) 5!
b) 4!
c) 3!
d) 6!

(xli) How many constraints does a 5 x 5 assignment problem have?

a) 8
b) 10
c) 12
d) 15

(xlii) How many variables does the dual of 5 x 5 assignment problem have?

a) 9
b) 10
c) 11
d) 12

(xliii) Which of the following is not a step in Hungarian algorithm?

a) Subtract row minimum from every row
b) Subtract column minimum from every column
c) Draw lines through ticked rows and unticked columns
d) Tick unassigned rows

(xliv) In a 4 x 4 assignment problem where 4 jobs are assigned to 4 machines, job 1 is Assigned to M2, job 2 to M4, Job 3 to M3. What is the fourth assignment?

a) Job 4 to M2
b) Job 4 to M1
c) Job 4 to M3
d) Job 4 to M4

(xlv) The activity that can be delayed without affecting the execution of the immediate succeeding activity is determined by

a) total float
b) free float
c) independent float
d) none of these

(xlvi) The full form of CPM is

a) Crash project management
b) Critical path management
c) Critical path method
d) None of these

(xlvii) Which of the following is not correct in respect of PERT calculations?

a) Expected time of an activity is a
b) The completion time of an activity is

a) The expected completion time of an activity is obtained as the weighted average of three times estimates, a, m, and b with respective weights of 1, 4, and 1.

b) The completion time of an activity is assumed to follow normal distribution.

c) The completion time of an activity is assumed to follow normal distribution.

d) The sum total of variances of critical activity times gives the variance of the overall project completion time.

(xlviii) Which of the following is not a rule of network construction?

a) Each defined activity is represented by one and only one arrow.

b) A network should have only initial and one terminal node.

c) Identical initial and final nodes can identify two activities..

d) Only as few dummy activities should be included as is warranted.

(xlix)

Consider the LP problem

Minimize $3X_1 + 8X_2 + 3X_3 + 7X_4$

subject to $3X_1 + 5X_2 + X_3$? 16;

$5X_1 + 3X_2 - X_4$? 12,

X_1, X_2, X_3, X_4 ? 0.

The number of artificial variables required to initialize the simplex table is ___

a) 1

b) 2

c) 3

d) 4

(l)

Consider the LP problem

Minimize $3X_1 + 8X_2$

subject to

$3X_1 + 5X_2$? 16

$5X_1 + 3X_2$? 12

X_1, X_2 ? 0.

The number of artificial variables required to initialize the simplex table is ___

a) 1

b) 2

c) 3

d) 4

(li)

Consider the LP problem

Maximize $3X_1 + 8X_2$

subject to

$3X_1 + 5X_2$? 16

$5X_1 + 3X_2$? 12

X_1, X_2 ? 0

In the simplex algorithm, the variables that enters first is ___ and this variable replaces variable ____

a) X_1, X_3

b) X_2, X_1

c) x2,x3

d) X_2, X_4

(lii)

Consider the LP problem:

Maximize $7X_1 + 6X_2$

subject to

$X_1 + X_2$? 4

$2X_1 + X_2$? 6

X_1, X_2 ?0.

Solve using the algebraic form of the simplex algorithm and answer the following:

At the end of the first iteration, the objective function coefficient for X_2 is ____

a) 2.5 b) 3.0

c) 3.5 d) 4.0

(liii)

Consider the LP problem:

Maximize $7X_1 + 6X_2$

subject to

$X_1 + X_2$? 4

$2X_1 + X_2$? 6

X_1, X_2 ?0.

Solve using the algebraic form of the simplex algorithm and answer the following:

At the optimum, the coefficient of variable X_3 in the objective function is ______

a) 2

b) 5

c) -5

d) -2

(liv)

Solve the LP problem

Maximize $3X_1 + 8X_2$

subject to

$3X_1 + 5X_2$? 16

$5X_1 + 3X_2$? 12

X_1, X_2? 0

Using the simplex algorithm.

The number of iterations taken by simplex algorithm is _________

a) 1

b) 2

c) 3

d) 6

(lv)

Solve the LP problem

Maximize $3X_1 + 8X_2$

subject to

$3X_1 + 5X_2$? 16

$5X_1 + 3X_2$? 12

X_1, X_2? 0

Using the simplex algorithm.

The value of objective function at optimum is ________

a) 25.2 b) 25.6

c) 25.3 d) 25.8

(lvi)

Solve the LP problem

Maximize $4X_1 + 3X_2 + 5X_3$

subject to

$X_1 + X_2 + X_3$? 10

$2X_1 + X_2 + 3X_3$?20

$3X_1 + 2X_2 + 4X_3$? 30

X_1, X_2, X_3 ? 0 using the simplex algorithm and answer the following questions. If you have a tie to decide a leaving variable, break the tie arbitrarily.

How many variables are there in the initial Simplex table

a) 2 b) 6

c) 3 d) 5

(lvii)

Solve the LP problem

Maximize $4X_1 + 3X_2 + 5X_3$

subject to

$X_1 + X_2 + X_3$? 10

$2X_1 + X_2 + 3X_3$?20

$3X_1 + 2X_2 + 4X_3$? 30

X_1, X_2, X_3 ? 0 using the simplex algorithm and answer the following questions. If you have a tie to decide a leaving variable, break the tie arbitrarily.

How many iterations, after the initial table did you take to reach the optimum

a) 1 b) 2

c) 3 d) 4

(lviii)

Solve the LP problem

Maximize $9X_1 + 3X_2 + 5X_3$

subject to

$4X_1 + X_2 + X_3$? 12

$2X_1 + 4X_2 + 3X_3$? 22

$5X_1 + 2X_2 + 4X_3$? 34

X_1, X_2, X_3 ? 0 using the simplex algorithm and answer the following questions.

The set of basic variables at the optimum is

a) $X_1\ X_2\ X_6$

b) $X_1\ X_3\ X_5$

c) $X_2\ X_3\ X_6$

d) $X_1\ X_3\ X_6$

(lix)

Solve the LP problem using Simplex algorithm

Minimize $9X_1 + 3X_2$

subject to

$4X_1 + X_2$? 12

$7X_1 + 4X_2$? 16

X_1, X_2 ? 0 using the simplex algorithm.

Which of the following is the correct answer

a) The optimum solution is (0, 4)

b) The problem is unbounded

c) The problem is infeasible with simplex showing artificial variable $a_1 = 3$ at optimum

d) The problem is infeasible with simplex showing artificial variable $a_1 = 20/7$ at optimum

(lx)

Solve the LP problem using Simplex algorithm

Minimize $2X_1 + 3X_2$

subject to

$X_1 + X_2$? 4

X_1 ?1

X_1, X_2 ? 0 using the simplex algorithm.

The value of X_2 at the optimum is ____

a) 12

b) 2

c) 3

d) 4

(lxi)

Solve the LP problem using Simplex algorithm

Minimize $2X_1 + 3X_2$

subject to $X_1 + X_2$? 4

$2X_1+4X_2$? 10

X_1, X_2 ? 0 using the simplex algorithm.

The value of X_2 at the optimum is ___

a) 0

b) 1

c) 2

d) 4

(lxii)

Consider the LP

Maximize $9X_1 + 3X_2$

subject to $4X_1 + X_2$? 12

$2X_1 + 4X_2$? 22

X_1, X_2 ?0.

Solve the primal using the graphical method. Is a dual solution $Y_1 = 15/7$, $Y_2 = 3/14$ optimum?

a) It is not optimum to the dual because it is not feasible to the dual

b) The dual solution is feasible but not optimum because the objective function value is different from that of the primal

c) Weak duality theorem is violated.

d) It is optimum using the optimality criterion theorem

(lxiii)

Consider the LP

Maximize $7X_1 + X_2$

subject to $X_1 + X_2$? 3

$X_1 + X_2$? 2

X_2 ? 0, X_1
unrestricted. Which of the following is NOT TRUE about the dual

a) The first constraint is an equation

b) The second variable is of ? type

c) The dual has two variables and two constraints

d) The second constraint is an equation

(lxiv)

Given the LP problem

Maximize $3X_1 + 5X_2 + 9X_3$

subject to $X_1 + X_2 + 2X_3$? 6

$2X_1 + 3X_2 + X_3$?8

X_1, X_2, X_3 ? 0

The dual has ____________ variables

a) 1

b) 2

c) 4

d) 3

(lxv)

Consider the LP

Maximize $2X_1 + 3X_2 + 4X_3 + X_4$

subject to $X_1 + 2X_2 + 5X_3 + X_4$? 12.

Xj ? 0. Solve the dual and find the optimum solution to the primal.

The value of the objective function at the optimum is ____

a) 18
b) 20
c) 22
d) 24

(lxvi)

Consider the LP

Maximize $2X_1 + 3X_2 + 4X_3 + X_4$

subject to $X_1 + 2X_2 + 5X_3 + X_4$? 12.

Xj ? 0. Solve the dual and find the optimum solution to the primal.

Only 11 units of the resource is available. The value of the objective function at optimum is ____________

a) 18
b) 20
c) 22
d) 24

(lxvii)

Consider the LP

Maximize $2X_1 + 3X_2 + 4X_3 + X_4$

subject to $X_1 + 2X_2 + 5X_3 + X_4$? 12.

Xj ? 0. Solve the dual and find the optimum solution to the primal.

If 100 units of the resource are available, the value of the objective function at optimum is _______

a) 120

b) 180

c) 200

d) 240

(lxviii)

Consider the LP problem:

Maximize $5X_1 + 12X_2$

subject to $2X_1 + 5X_2$? 13

$7X_1 + 11X_2$? 31

X_1, X_2 ? 0. Solve this problem using Simplex algorithm and answer the following:

Which of the following is NOT TRUE

a) This solution is not optimum because a variable can enter the basis and increase <div>the objective function further</div> <div> </div>

b) The solution is not optimum because the corresponding dual solution after <div>applying complimentary slackness conditions is infeasible</div> <div> </div>

c)

The variable y1 is in the solution when the

d) The variable y2 is in the solution when the dual is solved after applying <div>complimentary slackness</div>

dual is solved after applying complimentary slackness

<div> </div>

(lxix)

Consider the LP problem:

Maximize $5X_1 + 12X_2$

subject to $2X_1 + 5X_2$? 13

$7X_1 + 11X_2$? 31

X_1, X_2 ? 0. Solve this problem using Simplex algorithm and answer the following:

At the optimum, which of the following is NOT TRUE

a) The value of the objective function is 408/13

b) Variables X_1 and X_2 are in the basis

c) The shadow price of the first primal resource is non zero.

d) The dual has variables Y1 and Y3 in the basis

(lxx)

The maximum profit for the following 3 x 3 assignment problem is

[illegible]	[illegible]	[illegible]

a) 15

b) 18

c) 19

d) 23