U.G. 6th Semester Examination - 2021

COMPUTER SCIENCE

Course Code : BCOSDSHT6

Course Title: Operations Research

Full Marks : 40 Time : 2 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Choose the correct alternative for any **ten** of the following: 1×10=10

   a) The basic feasible solution for the set of equations:

   $x_1 + x_2 + 2x_3 = 9$

   $3x_1 + 2x_2 + 5x_3 = 22$ are

   i) No basic solution

   ii) (4,5,0) , (0,1,4)

   iii) (2,3,2) , (3,2,2)

   iv) None of these

   b) The assignment algorithm was devloped by_____ method

   i) HUNGARIAN

   ii) VOGELS

   iii) MODI

   iv) TRAVELING SALES MAN

   c) When the sum of gains of one player is equal to the sum of losses to another player in a game , this situation is known as _____

   i) Two-person game

   ii) Two-person zero-sum game

   iii) zero-some game

   iv) non-zero-sum game

   d) A feasible soluation of an Linear Programming Problem that optimizes the objective functions is called

   i) Basic feasible solution

   ii) Optimum Solution

   iii) Feasible Solution

   iv) Solution

   e) The cost of a surplus variable is

   i) 0

   ii) 1

   iii) 2

   iv) –1

   f) The soluation to a transportation problem with m - sources and n - destinations is feasible if the numbers allocations are _____

i) m + n

ii) mn

iii) m - n

iv) m + n -1

g) Maximization Assignment problem is transform into a minimization problem by

i) Adding each entry in a column from the maximum value in that column

ii) subtructing each entry in a column from the maximum value in that column

iii) Subtructing each entry in the table from the maximum value in that table.

iv) Adding each entry in the table from the maximum value in that table.

h) What do you mean by convex hull?

i) What is unit vector?

j) In an assignment problem incolving five workers and five jobs, total no of assignments possible are

i) 5 ii) 10

iii) 15 iv) 20

k) Write down the full form of 'PERT'.

l) The transportation problem deals with the transportation of _____.

i) A single product from a source to several destinations

ii) A single product from several source to several destinations

iii) A single product from source to a destination

iv) A multi-product from several source to several destinations

m) In critical path method the forward pass determine

i) lastest occurrence times of events.

ii) earliest occurrence times of events.

iii) duration of activity

iv) slack time of each activity

n) The dual of the dual is _____.

o) _____ is a mathematical technique used to solve the problem of allocating limited resource among the competing activities.

i) Linear Programming problem

ii) Assignment Problem

iii) Replacement Problem

iv) Non linear Programming Problem

2. Answer any **five** questions: 2×5=10

a) Define Operation Research.

b) What a slack and surplus variable?

c) What is convex set? What are its extreme points ?

d) Solve the following 2×2 games[games without saddle point] using mixed strategies.

		Player A	
		B_1	B_2
Player B	A_1	6	−4
	A_2	−1	2

e) What is saddle point?

f) Show that, whatever the value of 'a', be the following game is strickly determinable :

		B	
		I	II
A	I	3	7
	II	−3	a

g) What is Spanning Set?

h) Express the following minimization problems into standard maximization problems.

Minimize $z = 2x_1 - x_2 + x_3$

Subject to $4x_1 + x_2 + x_3 = 6$

$7x_1 + 3x_2 + 2x_3 \geq 20$

$4x_1 + 7x_2 - 3x_3 \leq 10,\ x_1, x_2, x_3 \geq 0$

3. Answer any **two** question : 5×2=10

a) Solve graphically the L.P.P.

Minimize $z = -2x_1 + x_2$

Subject to $x_1 + x_2 \geq 6$

$3x_1 + 2x_2 \geq 16$

$x_2 \leq 9,$

$x_1, x_2 \geq 0$

b) A company has three plants A,B,C and three warehouses X,Y,Z . The number of units available at the plants are 60,70,80 respectively. The demands at X,Y,Z are 50,80,80 respectively. The unit cost of transportation as follows.

	X	Y	Z
A	8	7	3
B	3	8	9
C	11	3	5

c) Proof that Dual of the Dual is primal problem.

4 . Answer any **one** question : 10×1=10

a) Write down the dual of the following problem and solving the dual problem by simplex method find the optimal solutions and optimal values of the primal and dual as well.

Maximize, $z = 3x_1 + 4x_2$

subject to, $x_1 + x_2 \leq 10$

$2x_1 + 3x_2 \leq 18$

$x_1 \leq 18$

$x_2 \leq 6 \quad x_1, x_2 \geq 0$

b) Solve the following Transportation problem:

	D_1	D_2	D_3	D_4	a_i
Q_1	10	7	3	6	3
Q_2	1	6	8	3	5
Q_3	7	4	5	3	7
b_j	3	2	6	4	

c) A factory is engaged in manufacturing three products A, B and C which involves lathe work, grinding and assembling . The cutting, grinding and assembling times required for one unit of A, are 2,1 and 1 hours, respectively. Similarly

they are 3, 1, 3 hours for one unit B and 1, 3, 1 hours for one unit of C. The profits on A, B and C are Rs.2, Rs.2 and Rs.4 per unit, respectively . Assuming that there are available 300 hours of lathe time , 300 hours of grinding time and 240 hours of assemble time, how many unit of each product should be produced to maximize profits. [solve by simplex method].

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