U.G. 6th Semester Examination - 2020

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: $1\times10=10$

a) The basic feasible solutions of the system of equations:

$$x_1 + x_2 + x_3 = 8$$

$$3x_1 + 2x_2 = 18 \text{ are}$$

i) No basic solution

ii) (2, 6, 0), (6, 0, 2)

iii) (1, 7, 0), (7, 1, 0)

iv) None of these

b) A set of values of decision variables $x_1, x_2, ..., x_n$ which satisfies the set of constraints and the non-negativity restrictions is called

i) an optimal solution

ii) a feasible solution

iii) only optimal solution

iv) None of these

c) Intersection of two convex set is also a convex set.

i) True

ii) False

d) A necessary and sufficient condition for a basic solution to a maximization type problem to be an optimal is that (for all j)

i) $z_j - c_j \geq 0$

ii) $z_j - c_j \leq 0$

iii) $z_j - c_j = 0$

iv) $z_j - c_j < 0$ or $z_j - c_j > 0$

e) The dual of the dual is

i) dual

ii) primal

iii) both dual and primal

iv) none of these

f) All variables in the solution of a linear programming problem are either positive or zero because of the existence of:

i) An objective function

ii) Structural constraints

iii) Limited resources

iv) None of the above

g) Which of the following assertions is true of an optimal solution to an LP?

i) Every LP has an optimal solution

ii) The optimal solution uses up all resources

iii) If an optimal solution exists, there will always be at least one at a corner

iv) All of the above

h) The solution of a transportation problem with m-source and n-destination is feasible if the number of allocation is

i) m+n–1

ii) n+m

iii) m+n+1

iv) mn

i) In a fair game the value of the game is

i) 1

ii) 0

iii) unbounded

iv) none of these

j) In an assignment problem involving n workers and n jobs, there would be

i) n solutions

ii) n! solutions

iii) (n–1)! solutions

iv) n*n solutions

k) Full form of PERT is

i) Program Estimation and Review Techniques

ii) Project Evaluation and Review Techniques

iii) Project Estimation and Research Techniques

iv) Project Evaluation and Research Techniques

l) 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) biased game

ii) unbiased game

iii) fair game

iv) none of these

m) In critical path computation, the forward pass determines

i) latest occurrence times of events

ii) earliest occurrence times of events

iii) duration of activity

iv) slack time of each activity

n) In an assignment problem, the minimum number of lines covering all zeros in the reduced cost matrix of order n can be

i) at most n

ii) n+1

iii) n–1

iv) at least n

o) Which among these methods does not give a basic feasible solution in Transportation Problem?

i) Hungarian method

ii) north west corner method

iii) minimum cost method

iv) VAM

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

a) What do you understand by a Linear Programming Problem?

b) A Company sells two different products A and B. The two products are produced in a common production process and sold in two different markets. The production process has a total capacity of 45000 man-hours. It takes 5 hours to produce a unit of A and 3 hours to produced a unit of B. The market has been surveyed and company officials feel that the maximum

number of units of A that can be sold is 7000 and that of B is 10000. If the profits is Rs.600 per unit for the product A and Rs.400 per unit for the product B, how many units of each product should be sold to maximize profit? Formulate the problem as a linear programming model.

c) What is Operations Research?

d) What are slack and surplus variables?

e) What is degeneracy in transportation problem?

f) What is saddle point?

g) Obtain the value of the game for the following pay-off matrix:

		Player B	
		I	II
Player A	I	1	7
	II	6	2

h) Define optimistic time, Pessimistic time and Most likely time in PERT calculations.

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

a) Find the optimal solution for the assignment problem with the following cost matrix:

	I	II	III	IV
A	14	5	8	7
B	2	12	6	5
C	7	8	3	9
D	2	4	6	10

b) A Project has following characteristics:

Activity	1-2	1-3	2-4	2-5	3-4	4-5
Duration (days)	8	4	10	2	5	3

Compute slack time for each activity and obtain the length of the critical path.

c) A Company makes two kinds of leather-belts *A* and *B*. Their 7 respective unit profits are Rs.4 and Rs.3. One belt of type *A* requires 2 hours and type *B* requires 1 hour of time in making. The total man-hours available are 1000 per day. Due to insufficient supply of leather, the company can make only 800 belts per day. Only 400 buckles for type *A* and 700 buckles for type *B* are available. Formulate the problem as an L.P.P. and solve it graphically.

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

a) A manufacturer produces two items X_1 and X_2. X_1 need 2 hours on machine A and 2 hours on machine B. X_2 needs 3 hours on machine A and 1 hour on machine B. If machine A can run for a maximum of 12 hours per day and B for 8 hours per day and profits from X_1 and X_2 are Rs.4 and Rs.5 per item respectively, find by simplex method, how many items per day be produced to have maximum profit?

b) Find the basic feasible solution of the following transportation problem by Vogel's approximation method. Also find the optimal solution and the minimum total cost of transportation. 4+6=10

	Destination				
Source	19	30	50	10	7
	70	30	40	60	9
	40	8	70	20	18
	5	8	7	14	

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