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SARDAR PATEL UNIVERSITY

B.Sc. (SEMESTER-III) EXAMINATION-2019

November 30, 2019, Saturday

2:00 p.m. to 4:00 p.m.

US03EMTH06 (Operations Research I)

Maximum Marks: 70

Q.1 Multiple choice question. [10]

(1) In graphical method the restriction on number of constraint is .....
(a) 2 (b) 3 (c) not more than 3 (d) none of these

(2) minimize $z =$ .....
(a) maximize (z) (b) maximize $(-z)$ (c) -maximize $(-z)$ (d) none of these

(3) In graphical representation the bounded region is known as ..... region.
(a) solution (b) optimal (c) basic solution (d) feasible solution

(4) In the simplex method for solving of LPP number of variables can be .....
(a) not more than three (b) at least three (c) at least two (d) none of these

(5) The ..... variable is added to the constraint of less than equal to type.
(a) slack (b) surplus (c) artificial (d) basic

(6) The Transportation Problem is said to be unbalanced if .....
(a) $\sum a_i \neq \sum b_i$ (b) $\sum a_i = \sum b_i$ (c) $z_j - c_j \geq 0$ (d) $z_j - c_j \leq 0$

(7) ..... method is used to obtain initial basic feasible solution of Transportation Problem.
(a) Simplex (b) North-West corner (c) Newton Raphson (d) Hungarian

(8) In non-degenerate solution number of allocated cell is .....
(a) $= m + n - 1$ (b) $\neq m + n - 1$ (c) $= m + n + 1$ (d) None of these

(9) The coefficient of artificial variable in the objective function of maximization problem is ....
(a) $+M$ (b) $-M$ (c) 0 (d) None of these

(10) The Penalty in VAM represents difference between ..... cost of respective row/column.
(a) two Largest (b) smallest two (c) largest and smallest (d) None of these

Q.2 Answer the following in short. (Attempt any 10) [20]

(1) List the applications of OR.
(2) Define Operation research.
(3) Write the standard form of Linear Programming problem,
Maximize $z = 3x_1 + 2x_2$
Subject to constraints $2x_1 + 23x_2 \leq 4;\ 15x_1 + 21x_2 \leq 5;\ x_1, x_2 \geq 0.$
(4) Define surplus variables.
(5) Write the standard form of Linear Programming problem,
Maximize $z = 13x_1 + 25x_2$
Subject to constraints $21x_1 + 3x_2 \leq 40;\ 5x_1 + 2x_2 \leq 7;\ x_1, x_2 \geq 0.$
(6) Define unbounded solution.
(7) What is transportation problem?
(8) Write dual of the following L.P.P.
Maximize $z = x_1 + 25x_2$
Subject to constraints $x_1 + 4x_2 \leq 10;\ 2x_1 + 3x_2 \leq 17;\ x_1, x_2 \geq 0.$
(9) What do you mean by balanced transportation problem?
(10) Write algorithm of North west corner method.
(11) Write mathematical form of transportation problem.
(12) Define loop in MODI method.

(P.T.O.)

Q.3

(a) A firm manufacture two types of product A and B and sells them at a profit of ₹ 5 and ₹ 9 on type A and B respectively. Each product is processed on two machines G and H. Type A requires 3 minutes of processing time on G and 2 minutes on H; Type B requires 1 minutes of processing time on G and 1 minutes on H. The machine G is available for not more than 5 hrs 10 minutes while H is available for not more than 8 hrs 20 minutes. Formulate this problem as Linear Programming Problem. [05]

(b) Write short note on the history of operations research. [05]

OR

Q.3

(c) Solve the following L.L.P. using graphical method, [05]
Maximize $z = 2x_1 + 3x_2$
Subject to constraints $x_1 + x_2 \leq 1;\ x_1 + x_2 \leq 3;\ x_1, x_2 \geq 0.$

(d) A carpenter produces two products chairs and tables. Processing of these products is done on two machines A and B. Chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours on machine A. There are 16 hours of time per day available on machine A and 30 hours on machine B. The profit per chair is ₹ 20 and ₹ 35 for table. Formulate the problem as LPP in order to maximize the profit. [05]

Q.4

(a) Write dual of the following L.P.P. [05]
Maximize $z = 3x_1 + 5x_2$
Subject to $x_1 + x_2 \geq 1;\ x_1 + x_2 \leq 15;\ x_2 \leq 8;\ x_1, x_2 \geq 0.$

(b) Solve the following L.L.P. using simplex method, [05]
Maximize $z = 3x_1 + 5x_2$
Subject to constraints $x_1 + x_2 \leq 4;\ 3x_1 + 2x_2 \leq 18;\ x_1, x_2 \geq 0.$

OR

Q.4

(c) Solve the following L.L.P. using simplex method, [05]
Maximize $z = 5x_1 + 3x_2$
Subject to constraints $3x_1 + 5x_2 \leq 15;\ 5x_1 + 10x_2 \leq 15;\ x_1, x_2 \geq 0.$

(d) Solve the following L.L.P. using Big M method, [05]
Maximize $z = 3x_1 - x_2$
Subject to constraints $2x_1 + x_2 \geq 2;\ x_1 + 3x_2 \leq 3;\ x_1,\ x_2 \geq 0.$

Q.5

(a) Find the initial basic feasible solution for the T.P. using VAM method. [05]

	A	B	C	D	Supply
1	6	3	5	4	22
2	5	9	2	7	15
3	5	7	8	6	8
Demand	7	12	17	9	

(b) Find the initial basic feasible solution for the T.P. using North west corner method. [5]

	D_1	D_2	D_3	D_4	Supply
S_1	6	4	1	5	14
S_2	8	9	2	7	16
S_3	4	3	6	2	5
Demand	6	10	15	4	

OR

Q.5

(c) Find the initial basic feasible solution for the transportation problem using least cost method. [5]

	D1	D2	D3	D4	Supply
O1	1	2	3	4	6
O2	4	3	2	0	8
O3	0	2	2	1	10
Demand	4	6	8	6	

(d) Find the initial basic feasible solution for the T.P. using North west corner method. [5]

	D1	D2	D3	D4	Supply
O1	1	2	1	4	30
O2	3	3	2	1	50
O3	4	2	5	9	20
Demand	20	40	30	10	

Q.6 Find the optimal solution of following Transportation Problem using MODI method. [10]

	Warehouse				
Factory	W_1	W_2	W_3	W_4	Supply
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Demand	5	8	7	14	

OR

Q.6 Find the optimal solution of following Transportation Problem using MODI method. [10]

	Destination				
Source	D_1	D_2	D_3	D_4	Supply
A	19	14	23	11	11
B	15	16	12	21	13
C	30	25	16	39	19
Demand	6	10	12	15	