USN | | | | | | | | | |

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Operation Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain the phases of operation search. **(04 Marks)**

b. The postmaster of a local post office wishes to hire extra helpers during new year season to manage large increase in the volume of mail handling and delivery. Due to the limited office space and budget condition, the number of temporary helpers must not exceed 10. According to past experience men can handle 300 letters and 80 packages per day and women can handle 400 letters and 50 packages per day. The post master believes that the daily volume of extra mail and packages will not be more than 3400 and 680 respectively. A man receives Rs. 250/- a day and a woman receives Rs. 220/- a day. How many number of men and women helpers should be hired to keep the payroll at a minimum. **(06 Marks)**

c. A toy company manufactures two types of dolls, a basic version doll 'A' and a deluxe version doll 'B'. Each doll of type B takes twice as long to produce as one of type A and the company would have time to make a maximum 2000 per day. The supply of plastic is sufficient to produce 1500 dolls per day (both A and B combined). The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes profit of Rs. 3.00 and Rs. 5.00 per dell respectively on doll A and B. How many of each should be produce per day in order to maximize profit. Solve by using graphical method. **(10 Marks)**

2 a. Solve the following LPP using Simplex method :

Maximize $Z = 4x_1 + 10x_2$

Subject to
$2x_1 + x_2 \le 50$
$2x_1 + 5x_2 \le 100$
$2x_1 + 3x_2 \le 90$
and $x_1, x_2 \ge 0$. **(10 Marks)**

b. Explain the following with example :
i) Slack variables
ii) Surplus variables
iii) Basic solution
iv) Optimal solution
v) Unbounded solution. **(10 Marks)**

3 a. Solve the following LPP with Penalty method :

Maximize $Z = 5x_1 + 6x_2$

Subject to
$2x_1 + 5x_2 \ge 1500$
$3x_1 + x_2 \ge 1200$
$x_1, x_2 \ge 0$. **(08 Marks)**

b. Using Two–phase method solve the following LPP :

Minimize $Z = x_1 + x_2$

Subjected to $2x_1 + x_2 \ge 4$
$x_1 + 7x_2 \ge 7$
$x_1, x_2 \ge 0$. **(12 Marks)**

4 a. Use revised Simplex method to solve LPP :
Maximize $Z = 6x_1 - 2x_2 + 3x_3$
Subjected to $2x_1 - x_2 + 2x_3 \leq 2$
$x_1 + 4x_3 \leq 4$
$x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

b. Write the dual of the following :
Minimize $Z = 3x_1 - 6x_2 + 4x_3$
Subject to $4x_1 + 3x_2 + 6x_3 \geq 9$
$x_1 + 2x_2 + 3x_3 \geq 6$
$6x_1 - 2x_2 - 2x_3 \leq 10$
$x_1 - 2x_2 + 6x_3 \geq 4$
$2x_1 + 5x_2 - 3x_3 \geq 6$
and $x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

PART – B

5 a. Apply the principle of duality to solve the LPP :
Maximize $Z = 3x_1 + 2x_2$
Subject to $x_1 + x_2 \geq 1$
$x_1 + x_2 \geq 7$
$x_1 + 2x_2 \geq 10$
$x_2 \leq 3$
and $x_1, x_2 \geq 0.$ **(10 Marks)**

b. Solve the following by using dual simplex method :
Minimize $Z = 2x_1 + x_2 + 3x_3$
Subject to $x_1 - 2x_2 + x_3 \geq 4$
$2x_1 + x_2 + x_3 \leq 8$
$x_1 - x_3 \geq 0.$
and with all variables non-negative. **(10 Marks)**

6 a. Write different steps in Hungarian algorithm to solve an assignment problem. **(08 Marks)**

b. A company is spending Rs. 1000 everyday on transportation of its units form three plants to four distribution centers. The supply and demand units with unit cost of transportation are given as :

	Distribution centre				
Plant	D_1	D_2	D_3	D_4	Capacity
P_1	19	30	50	12	7
P_2	70	30	40	60	10
P_3	40	10	60	20	18
Demand	5	8	7	15	

What will be the maximum saving to the company by optimum scheduling? **(12 Marks)**

7 a. Explain the following :
i) Minimax and maximin principle
ii) Pure and mixed strategy
iii) Two persons zero sum game
iv) Saddle point. **(08 Marks)**

b. Using dominance concept, obtain the optimal strategies for both the players and determine the value of the game. The pay off matrix for player A is given **(06 Marks)**

A \ B	I	II	III	IV	V
I	2	4	3	8	4
II	5	6	3	7	8
III	6	7	9	8	7
IV	4	2	8	4	3

c. Solve the following game by graphical method :

	B_1	B_2	B_3	B_4
A_1	2	2	3	–1
A_2	4	3	2	6

(06 Marks)

8 Explain briefly :
a. Table search algorithm
b. Genetic algorithm
c. Metaheuristics
d. Simulated annealing algorithm. **(20 Marks)**

* * * * *