BRAINWARE UNIVERSITY

Course – MCA

Operation Research (MCA305)

(Semester – 3)

Time allotted: 3 Hours **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)

10 x 1 = 10

1. *Choose the correct alternative from the following*

(i) What is the method used to solve an LPP involving artificial variable

a. Dominance method b. Charnes-Big M method

c. VAM d. None of these.

(ii) The optimality condition for minimization LPP in the simplex method is

a. $Z_j - C_j \leq 0$, $\forall j$ b. $Z_j - C_j \geq 0$, $\forall j$

c. $Z_j - C_j > 0$, $\forall j$ d. $Z_j - C_j = 0$, $\forall j$

(iii) The basic feasible solution of the system of equations $x_1 + x_2 + x_3 = 8$, $3x_1 + 2x_2 = 18$ are

a. No basic solution b. (2, 6, 0), (6, 0, 2)

c. (1, 7, 0), (7, 1, 0) c. None of these.

(iv) Let the time estimates for a particular activity be $t_o = 5$ days, $t_m = 7$ days, $t_p = 9$ days. Then the expected time t_c is (where the symbols have their usual meanings)

a. 10 days b. 15 days

c. 5 days d. 7 days

(v) If a variable x_i is unrestricted in sign in a primal LPP, then the corresponding ith constraint in the dual problem will be

a. ≤Type b. ≥ Type

c. Equality constraint d. None of these.

(vi) In networking problem, the activity for which total float is 0, is called

a. Critical Activity
b. Independent Activity
c. Probabilistic activity
d. None of these.

(vii) The possible number of basic solutions in a system of m equations with n unknowns is

a. n!/(m!(m-n)!)
b. m!/(n!(n-m)!)
c. (n+m)!
d. None of these.

(viii) Every extreme point of the convex set of feasible solutions of the system $Ax = b$, $x \geq 0$ corresponds to

a. A basic solution
b. A feasible Solution
c. Both (a) and (b)
d. None of these.

(ix) Any solution to a LPP which satisfies the non negativity restrictions of the LPP is called its

a. Unbounded solution
b. Feasible solution
c. Optimal solution
d. None of these.

(x) In simplex algorithm, which method is used to deal with the situation where an infeasible starting basic solution is given?

a. Slack variable
b. Charnes-Big M method
c. Simplex method
d. None of these.

Group – B

(Short Answer Type Question)

(Answer any *three* from the following)

3 x 5 = 15

2. A diet is to contain at least 4000 units of carbohydrates, 500 units of fat and 300 units of protein. Two foods A and B are available. Food A costs 2 dollars per unit and food B costs 4 dollars per unit. A unit of food A contains 10 units of carbohydrates, 20 units of fat and 15 units of protein. A unit of food B contains 25 units of carbohydrates, 10 units of fat and 20 units of protein. Formulate the problem as an LPP so as to find the minimum cost for a diet that consists of a mixture of these two foods and also meets the minimum requirements. [5]

3. Find the dual of the following LPP

Min $z = 5x_1 + 3x_2$

sub to : $2x_1 + 4x_2 \leq 12$

$2x_1 + 2x_2 = 10$

$5x_1 + 2x_2 \geq 10$ and $x_1 , x_2 \geq 0$ [5]

4. Find all the basic feasible solutions of the following system of equations
$-4x_2 + x_3 = 6$
$2x_1 - 2x_2 - x_4 = 1$
$x_1, x_2, x_3, x_4 \geq 0$ [5]

5. Solve the following LPP graphically
Max Z $= 120x + 100y$
Sub to: $10x + 5y \leq 80$
$6x + 6y \leq 66$
$4x + 8y \geq 24$
$5x + 6y \leq 90$ and $x, y \geq 0$ [5]

6. Four persons A, B, C and D are to be assigned four jobs I, II, III and IV. The cost matrix is given below, find the proper assignment.

Man/ Jobs	A	B	C	D
I	8	10	17	9
II	3	8	5	6
III	10	12	11	9
IV	6	13	9	7

[5]

Group – C

(Long Answer Type Question)
(Answer any *three* from the following)

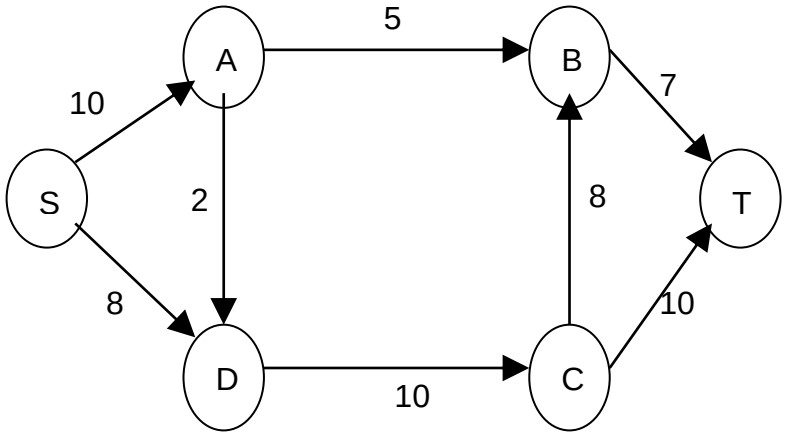
3 x 15 = 45

7. (a) Find the optimum transportation schedule and minimum total cost of transportation from the following matrix.

	D_1	**D_2**	**D_3**	**Supply**
O_1	10	7	8	40
O_2	15	12	9	15
O_3	7	8	12	40
Demand	25	55	20	

[8]

(b) Find the maximum flow for the following network diagram



[7]

8. (a) Solve the following LPP by simplex method

Max $Z = -2x_1 - x_2$

Sub to : $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

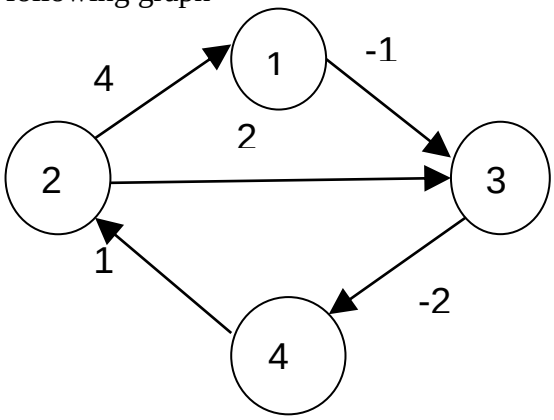
$x_1 + x_2 \leq 4$ and $x_1, x_2 \geq 0$ [9]

(b) Solve the following travelling salesman problem

Cities	**A**	**B**	**C**	**D**	**E**
A	-	10	8	9	7
B	10	-	10	5	6
C	8	10	-	8	9
D	9	5	4	-	6
E	7	6	9	6	-

[6]

9. a) Find all pair shortest path using Floyd Warshall algorithm from the following graph



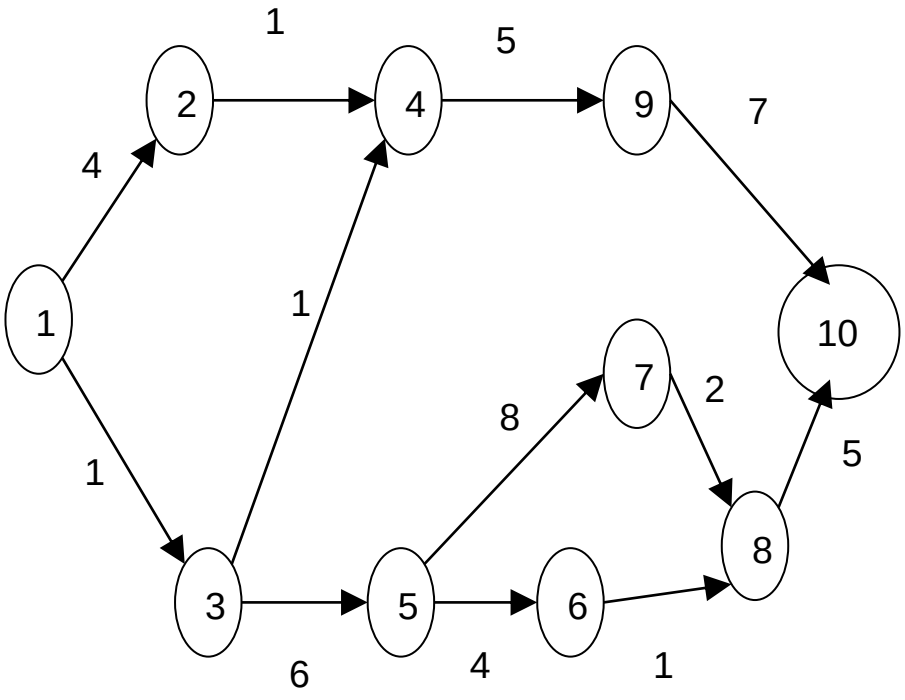
[8]

b) The precedence relationship of the different activities constituting a project are given below, draw the activity diagram.

Activity	Preceding Activity
A	-
B	-
C	B
D	B
E	A, B
F	A
G	F
H	C, E, G
I	F

[7]

10. a) An activity diagram is given below, compute earliest expected time (TE) and latest allowable time (TE) for each activity and find the critical path.



[9]

b) Define Basic solution, Basic feasible solution, optimum solution and degenerate solution. [6]