BRAINWARE UNIVERSITY

Course – MBA

Operations Research (MBA301)

(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)

1. Choose the correct alternatives for the following: **10 x 1 = 10**

i) The innovative science of Operations Research was discovered during

a) Civil War   b) World War 1   c) World War 2   d) None of the above

ii) When total supply is equal to total demand in a transportation problem, the problem is said to

be

a) Balanced   b) Unbalanced   c) Degenerate   d) None of the above

iii) Which of the following random number assignments could be used for an event that has a 35% chance of occurrence?

a) 00-31   b) 00-32   c) 00-34   d) 00-35

iv) In Vogel's Approximation Method, the opportunity cost associated with a row is determined by

a) The difference between the smallest cost and the next smallest cost in the row

b) The difference between the smallest unused cost and the next smallest unused cost in the row

c) The difference between the smallest cost and next smallest unused cost in the row

d) None of the above

v) The solution to a transportation problem with 'm' rows (supplies) & 'n' columns (destination) is feasible if number of positive allocations are

a) m+n   b) m*n   c) m+n-1   d) mn-1

vi) One of most widely used exponential distributions is called a

a) Passion distribution   b) Possible distribution   c) Poisson distribution   d) Poisson association

vii) In simplex method, feasible basic solution must satisfy the

a) non-negativity constraint b) negativity constraint   c) basic constraint d) common constraint

viii) Which of these is not correct

a) PERT is probabilistic in nature.

b) CPM is deterministic in nature.

c) CPM is event-oriented.

d) CPM and PERT use similar terminology but were developed independently.

ix) The northwest corner rule requires that we start allocating units to shipping routes in the:

a) Middle cell   b) Lower right corner of the table c) upper left hand corner of the table d) upper right corner of the table

x) In a departmental store customers arrive at a rate of 20 customers per hour. The average number of customers that can be handled by cashier is 24 per hour. What is the service rate in this problem?

a) 20   b) 3   c) 24   d) 10

Group B

(Short Answer Type Questions)

Answer any three of the following   **3 x 5 = 15**

2. Solve by graphical Method:

Minimize $Z = 4X_1 + 2X_2$
Subject to $X_1 + X_2 >= 3$
$X_1 - X_2 <= 2$
$X_1, X_2 >= 00$

3. Find the dual of the following problem

Minimize $Z = 30x_1 + 20x_2$

Subject to constraints: $-x_1 - x_2 \geq -8$

$$-6x_1 - 4x_2 \leq -12$$

$$5x_1 + 8x_2 = 20$$

$$x_1, x_2 \geq 0$$

4. A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 20 minutes. If he repairs the sets in the order in which they come and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hours a day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

5. Following table gives pay-offs for actions A1, A2 and A3 corresponding to states of nature S1 and S2 whose chances are 0.6 and 0.4 respectively.

States of Nature	Actions		
	A_1	A_2	A_3
S_1	16	3	8
S_2	2	5	4

Find decisions under: i) Maximin Criterion, ii) EMV criterion

Group C

(Long Answer Type Questions)

Answer any three of the following   **3 x 15 = 45**

6. a) Consider the following transportation cost table. The costs are given in rupees; the supply and demand are in units. Determine an optimal solution by using VAM.

Source	Destinations					
	1	2	3	4	5	Supply
I	40	36	23	38	30	320
II	38	28	34	34	198	560
III	36	38	24	28	30	480
Demand	320	320	400	140	480	

b) Project manager has listed down the activities in the project as under:

Activity	Immediate preceding activity	Activity Time (weeks)
A	-	3
B	-	4
C	A	5
D	A	6
E	C	7
F	D	8
G	B	9
H	E,F,G	3

Construct a network diagram of the project and identify the critical path by means of double line.

[7+8=15]

7. Use Simplex Method to solve the following LPP: [15]

Maximize $Z = 50x_1 + 60x_2$

Subject to constraints: $2x_1 + x_2 <= 300$

$$3x_1 + 4x_2 <= 480$$

$$4x_1 + 7x_2 <= 812$$

$$x_1, \ x_2 >= 0$$

8. Water Limited has two products Drought and Flood. To produce one unit of Drought 3 units of material A and 1 unit each of material B and material C are required respectively. To produce 1 unit of Flood, 1 unit each of material A and material B respectively and 2 units of material C are required. Not more than 40 units of material C can be used and atleast 27 units of material A must be used and the use of material B in total should be equal to 21. The selling price per unit of drought & Flood are Rs 16 and Rs 8 respectively. The manufacturing cost per unit of Drought and Flood are Rs 8 and Rs 4 respectively. You are required

i) To formulate the mathematical model

ii) To solve it to minimise cost graphically.   [7+8=15]

9. a) A project consists of four major jobs for which four contractors have submitted tenders. The tender amounts quoted in thousands of rupees are given in the following matrix. Find the assignment which minimizes total cost of the project. Each contractor has to be assigned one job only.

	J1	J2	J3	J4
C1	15	29	35	20
C2	21	27	33	17
C3	17	25	37	15
C4	14	31	39	17

b) Consider the following transportation cost table. The costs are given in rupees; the supply and demand are in units. Determine a basic feasible solution NWCM:

Source	Destinations					
	1	2	3	4	5	Supply
I	40	36	23	38	30	320
II	38	28	34	34	198	560
III	36	38	24	28	30	480
Demand	320	320	400	140	480	

[8+7=15]