



AMITY UNIVERSITY

UTTAR PRADESH

Amity Campus
Uttar Pradesh
India 201303

ASSIGNMENTS PROGRAM: BFIA SEMESTER-II

Subject Name	: Operations Research
Batch	:
Roll Number (Reg.No.)	:
Student Name	:

INSTRUCTIONS

- a) Students are required to submit all three assignment sets.

ASSIGNMENT	DETAILS	MARKS
Assignment A	Five Subjective Questions	10
Assignment B	Three Subjective Questions + Case Study	10
Assignment C	Objective or one line Questions	10

- b) Total weightage given to these assignments is 30%. OR 30 Marks
c) All assignments are to be completed as typed in word/pdf.
d) All questions are required to be attempted.
e) All the three assignments are to be completed by due dates and need to be submitted for evaluation by Amity University.
f) The students have to attached a scan signature in the form.

Signature : _____
Date : _____

() Tick mark in front of the assignments submitted

Assignment 'A'	<input type="checkbox"/>	Assignment 'B'	<input type="checkbox"/>	Assignment 'C'	<input type="checkbox"/>
-------------------	--------------------------	----------------	--------------------------	----------------	--------------------------

Assignment

Part A

1. Give the role & significance of O.R. in business & industry for scientific decisions.
2. “The primary contribution of the game theory has been its concept rather than its formal application to solving real life problems.” Do you agree? Discuss.
3. What is queuing theory? Describe the different types of costs involved in a queuing system. In what areas of management can queuing theory be applied successfully? Give examples.
4. What do you mean by Simulation? Explain Monte Carlo Simulation in present business decision making.
5. Explain the terms: (a) Basic feasible solution; (b) Non-degenerate basic feasible solution; (c) Optimal solution and (d) Pivot column

Part B

6. Explain in brief with examples: (i) North West Corner rule (ii) Vogel’s Approximation Method.
7. Show that assignment problems are particular cases of transportation problem. Can an assignment problem ever be a non degenerate transportation problem? Explain.
8. “Basic Problem in queuing theory is to strike an economic balance between the service cost and the waiting cost.” Elucidate this statement by taking an example.

Case Study

M/s Gupta chemicals Ltd. Markets its product through five area distributors. The company has three plants the particulars of which are given below:

Plant	Monthly production capacity (kgs)	Fixed cost of production (Rs/month)	Variable cost of production) (Rs./unit)
P1	6,000	2,40,000	120
P2	15,000	5,00,000	110
P3	22,500	6,00,000	90

The selling price excluding freight is Rs. 250 per kg and the company has commitments to supply the following quantities to the distributors:

Distributors	Quantity to be supplied (kg.)
I	3,750
II	3,750

III	7,500
IV	15,000
V	6,000

The transportation cost, rupees per unit (borne by the manufacturer), for supply for plants to distributor are as given below:

Plant/Distributors	I	II	III	IV	V
P1	1.2	1.5	1.0	1.5	1.0
P2	1.5	1.8	1.2	1.2	1.5
P3	1.6	1.7	1.0	0.9	0.5

Determine the optimal tie-up between the plants and the distributors and the maximum profit company can make.

Part C

- Every corner of the feasible region is defined by
 - the intersection of 2 constraints lines
 - Some subset of constraint lines and non negativity condition
 - Neither of the above
- G.J. Breveries Ltd. Have two bottling plants, one located at 'G' and the other at 'J'. Each plant produces three drinks – whisky, beer and brandy names A, B and C respectively. The number of bottles produced per day are as follows:

Drinks	Plant	
	G	J
Whisky	1,500	1,500
Beer	3,000	1,000
Brandy	2,000	5,000

A market survey indicated that during the month of July, there will be a demand of 20,000 bottles of whisky, 40,000 bottles of beer and 44,000 bottles of brandy. The operating costs per day of plants at G & J are 600 and 400 monetary units. For how many days each plant be run in July so as to minimize the production cost, while still meeting the market demand?

- $x_1 = 10, x_2 = 4, \text{Max } Z = 8,800$
- $x_1 = 12, x_2 = 4, \text{Max } Z = 8,800$
- $x_1 = 10, x_2 = 4, \text{Max } Z = 4,400$
- $x_1 = 12, x_2 = 2, \text{Max } Z = 2,200$

3. Five machines are available to do five different jobs. From past records, the time (in hrs.) that each machine takes to do each job is known & given in the following table:

<i>Machine/Job</i>	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>
<i>A</i>	2	9	2	7	1
<i>B</i>	6	8	7	6	1
<i>C</i>	4	6	5	3	1
<i>D</i>	4	2	7	3	1
<i>E</i>	5	3	9	5	1

Find the assignment of machines to jobs that will minimize the total time taken.

- (a) 10 hours
- (b) 12 hours
- (c) 13 hours
- (d) 22 hours

4. In performing a simulation it is advisable to

- (a) Use the results of earlier decisions to suggest the next decision to try
- (b) Use the same number of trials for each decisions
- (c) Simulate all possible decisions
- (d) None of the above

1. The assignment problem consists of the following elements-

- (a) A set of n jobs
- (b) A set of n facilities
- (c) A set of cost, one for each pair of job facility
- (d) All of the above

2. Find the optimal strategies for two stores from the following payoff matrix showing gain or loss of customers for store 1.

		Action of StoreY		
		A	B	C
Action of Store X	I	0	20	-60

	II	30	-10	-20
	III	70	-80	-30

- (a) Optiamal strategy (II, A), Value of game= -20
- (b) Optiamal strategy (I, D), Value of game= -40
- (c) Optiamal strategy (II, C), Value of game= -20
- (d) Optiamal strategy (II, B), Value of game= -40

3. The phrase ‘unbounded LP’ means that

- (a) at least one decision variable can be made arbitrarily large without leaving the feasible region
- (b) The objectives contours can be moved as far as desired, in the optimizing direction, and still touch at least one point in the constraint set.

4. Two firms A and B (manufacturing of detergent powder) are planning to make fund allocation for advertising their products. The matrix given below shows the percentage of market share of firm A for its various advertising policies. Determine the optimal strategy for firm A.

		Firm A			
		Strategies	No advertising	Medium advertising	Large advertising
Firm B	No advertising	60	50	40	
	Medium advertising	70	55	45	
	Large advertising	80	60	50	

- (a) Large advertising, 60
- (b) Medium advertising, 55
- (c) No advertising, 50
- (d) Large advertising, 50

5. An advantage of simulation, as opposed to optimization, is that

- (a) Often multiple measures of goodness can be examined
- (b) Some appreciation for the variability of outcomes of interest can be obtained
- (c) More complex scenarios can be studied
- (d) All of the above

6. Following is payoff matrix in terms of increase in votes to X(loss to Y) using three different strategies available to each player for advertising. Find optimal strategy to be adopted by X for the campaign and the number of votes X will gain with this strategy.

		Candidate Y		
		Strategy	I	II
Candidate X	A	300	200	100
	B	600	500	400
	C	600	400	600

- (a) (A, I), (C, II); Value of game = 400
 (b) (B, II), (A, III); Value of game = 500
 (c) (C, III), (B, II); Value of game = 300
 (d) (C, I), (C, III); Value of game = 600
7. The most difficult aspect of performing a formal economic analysis of queueing systems is
- (a) Estimating the service cost
 (b) Estimating the waiting cost
 (c) Estimating use
8. In a typical simulation model input provided by the analyst includes
- (a) Value for the parameters
 (b) Value for the decision variables
 (c) Value for the measure of effectiveness
 (d) Both (a) and (b)
9. The scientific method in O.R. study generally involves
- (i) Judgement phase
 (ii) Research phase
 (iii) Action phase
 (iv) All of the above
10. The operations Research models can be classified according to
- (i) degree of abstraction
 (ii) structure
 (iii) purpose

- (iv) nature of environment
- (v) all of the above

11. One of the disadvantages of simulation is that:

- (a) it is very expensive & requires to develop large repetitions of data
- (b) Simulation solution can be cent percent accurate.
- (c) Simulation is applicable in cases where there is an element of randomness in a system.
- (d) All of the above.

12. An Operations Research model is good as

- (i) It provides some logical & systematic approach to the problem
- (ii) It incorporates useful tools which help in eliminating duplication of methods applied to solve specific problem
- (iii) It helps in finding avenues for new research & improvements in a system.
- (iv) It indicates the nature of measurable quantities in a problem.
- (v) All of the above.

13. With small sample sizes the results of a simulation can be very sensitive to the initial conditions.

- (a) True
- (b) False
- (c) Can not say
- (d) None of the above

14. Which of the following does not apply to the basic queuing model?

- (a) Exponentially distributed arrivals
- (b) Exponentially distributed service times
- (c) Finite time horizon
- (d) Unlimited queue size

15. In business & management decision making, the O.R. study helps to have

- (i) Better control
- (ii) better system
- (iii) better decisions
- (iv) all of the above

16. Simulation is not possible if the complete knowledge of the system is not known.

- (a) True
- (b) False
- (c) Cannot say
- (d) None of the above

17. Linear programming is

- (a) a constrained optimization model
- (b) a constrained decision making model
- (c) a mathematical programming model
- (d) all of the above

18. The non negativity requirement is included in an LP because

- (a) it makes the model easier to solve
- (b) it makes the model correspond more closely to the real world problem
- (c) Both (a) and (b)
- (d) Neither of the above

19. Which of the following assertions is true of an optimal solution to an LP?

- (a) Every LP has an optimal solution.
- (b) The optimal solution always occurs at an extreme point
- (c) The optimal solution uses up all resources
- (d) If an optimal solution exists, there will always be at least one at a corner.

20. In Vogel's approximation method, the opportunity cost associated with a row is determined by

- (a) the difference between the smallest cost & the next smallest cost in that row
- (b) the difference between the smallest unused cost & the next smallest unused cost in that row
- (c) the difference between the smallest cost & the next smallest unused cost in that row
- (d) None of the above

21. Once a queue model has been constructed, analysis of the model can be performed in

- (a) Through analytical solution
- (b) Through simulation
- (c) Either (a) or (b)
- (d) Both

22. An unbalanced transportation problem is the one in which

- (a) the number off jobs are not equal to number of facilities
- (b) the total supply is not equal to total requirement
- (c) the total supply is same as total requirement

(d) None of the above

23. A closed path has all the following characteristics except:

- (a) It links an unused square with itself.
- (b) Movements on the path may occur horizontally, vertically, or diagonally.
- (c) The corners of the path must all be stones, except for the corner at the unused square being evaluated.
- (d) The path may skip over unused squares or stones.

24. A company produces three products A, B & C. These products require three ores O1, O2 and O3. The maximum quantities of the ores O1, O2 and O3 available are 22 tones, 14 tones and 14 tones respectively. For one tonne of each of these products , the ore requirements are:

Product	O1	O2	O3	Profit per tonne (in Rs.)
A	3	1	3	1
B	-	2	2	4
C	3	3	0	5

How many tonnes of each product A, B & C should company produce to maximize the profits?

- (a) Maximum Rs. 28,000; 7 tonnes of product B & none of A or C
- (b) Maximum Rs. 22,000; 5 tonnes of product A & none of B or C
- (c) Maximum Rs. 20,000; 5 tonnes of product C & none of A or B
- (d) Maximum Rs. 28,000; 7 tonnes of product A & none of B or C

25. The North-west corner rule

- (a) Is used to find an initial feasible solution.
- (b) Is used to find an initial optimal solution.
- (c) Is based on the concept of minimizing opportunity cost
- (d) None of the above

26. A cement factory manager is considering the best way to transport cement from his three manufacturing centers P, Q, R to depots A, B, C, D and E. The weekly production and demands alongwith transportation costs per tonne are given below:

Manufacturing centre- Depot	A	B	C	D	E	Supply
P	4	1	3	4	4	60
Q	2	3	2	2	3	35
R	3	5	2	4	4	40
Demand	22	45	20	18	30	135

Calculate the minimum total transportation cost.

- (a) 190
- (b) 200
- (c) 290
- (d) 390

27. Roma pharmaceutical company products two popular drugs A & B which are sold at the rate of Rs. 9.60 & Rs. 7.80 respectively. The main ingredients are X, Y & Z & they are required in the following properties:

Drugs	X	Y	Z
A	50%	30%	20%
B	30%	30%	40%

The total available quantities (gms.) of different ingredients are 1,600 in X, 1400 in Y & 1200 in Z. The costs of X, Y & Z per gm are Rs. 8, Rs. 6 & Rs. 4 respectively.

Estimate the most profitable quantities of A & B to be produced, using the simplex method.

- (a) Maximum Value of Z= 20,000; X1= 2000 & X2= 2000.
- (b) Maximum Value of Z= 40,000; X1= 4000 & X2= 2000.
- (c) Maximum Value of Z= 10,000; X1= 2000 & X2= 4000.
- (d) Maximum Value of Z= 10,000; X1= 2000 & X2= 2000.

28. Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table:

Jobs/Machines	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

Find out minimum cost possible through optimal assignment of machines to jobs.

- (a) A-II, B-IV, C-V, D-III, E-II; Minimum cost = 60
- (b) A- III, B-II, C- I, D- IV, E- V; Minimum cost = 120
- (c) A- I, B- III, C- IV, D- II, E- V; Minimum cost = 60
- (d) A- IV, B- II, C- I, D-V, E- III; Minimum cost = 120

29. The maximum number of items that can be allocated to an unused route with the stepping stone algorithm is

- (a) the maximum number in any cell
- (b) the minimum number in any cell
- (c) the minimum number in an increasing cell
- (d) the minimum number in a decreasing cell on the stepping stone path for that route

30. Obtain an initial basic feasible solution to the following transportation problem:

Warehouse/- stores	I	II	III	IV	Supply
A	7	3	5	5	34
B	5	5	7	6	15
C	8	6	6	5	12
D	6	1	6	4	19
Demand	21	25	17	17	80

- (a) 300
- (b) 324
- (c) 225
- (d) 356

31. A major goal of queuing is to

- (a) Minimizing the cost of providing service
- (b) Provide models which help the manager to trade off the cost of service
- (c) Maximize expected return
- (d) Optimize system characteristics

32. Determine the optimal strategies for both Firm A and Firm B and the value of the game (using maximin-minimax principle):

		Firm B				
		3	-1	4	6	7
Firm A	-1	8	2	4	12	
	16	8	6	14	12	
	1	11	-4	2	1	

- (a) Optimal strategy (2, 2)
- (b) Optimal strategy (3,4)
- (c) Optimal strategy (3, 5)
- (d) Optimal strategy (3, 3)

33. Solve the value of game whose payoff matrix is given by:

Strategy	B1	B2	B3	B4
A1	16	-60	56	-58
A2	-20	28	-18	-24
A3	24	8	0	24

- (a) For player A= -42 &for player B= 42
- (b) For player A= -20 &for player B= 20
- (c) For player A= -24 &for player B= 24
- (d) For player A= -28 &for player B= 28

34. A queue is formed when

- (a) Customers wait for services
- (b) Service facilities stand idle & wait for cusomers
- (c) Either (a) or (b)
- (d) Both

35. The MODI method uses the stepping stone path

- (a) to calculate the marginal cost of unused cells
- (b) to determine how many itesms to allocate to the selected unused cell
- (c) To determine the values of the row and column indexes.
- (d) None of the above

36. Characteristics of queues such as 'expected number' in the system:

- (a) Are relevant after the queue has reached a steady state
- (b) Are probabilistic statements
- (c) Depend on the specific model
- (d) All of the above