R17

Code No: 742AD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MBA II Semester Examinations, June/July-2018
QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS

Time: 3hours **Max.Marks:75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A **5 × 5 Marks = 25**

1.a) Choose the right alternative :

i) When did the operations research originated and applied practically?
a) 1990s b) 1970s c) 1940s d) 1920s

ii) What is the core assumption in linear programming?
a) Linear results b) Linear Variables
c) Linear data d) Linear Relationship

iii) Where does the operations research cannot be applied?
a) Optimization b) the distribution of material
c) Performance analysis d) None of the above

iv) What is 'finding the maximum or the minimum of an objective function of a set of decision variables', called as?
a) Performance analysis b) Optimization
c) None of the above d) the distribution of material

v) What is not an application of operations research?
a) facility planning b) scheduling
c) yield management d) none of the above [5]

b) Use graphical method to solve the problem:

Minimize $Z = 3x_1 + 2x_2$
Subject to $x_1 + 2x_2 \leq 12$
$2x_1 + 3x_2 = 12$
$2x_1 + x_2 \geq 8$
And
$x_1 \geq 0, x_2 \geq 0$ [5]

c) A small airline, operating seven day a week, serves three cities Nasik, Pune and Aurangabad, according to the schedule shown in table. The layover cost per stop is roughly proportional to the square of layover time. How should planes be assigned so as to minimize total layover cost? [5]

Flight no.	From	Time of Departure	To	Time of arrival
1	Pune	9:00 AM	Nasik	Noon
2	Pune	10:00 AM	Nasik	1:00 PM
3	Pune	3:00 PM	Nasik	6:00 PM
4	Pune	8:00 PM	Aurangabad	Midnight
5	Pune	10:00 PM	Aurangabad	2:00 AM
6	Nasik	4:00 AM	Pune	7:00 AM
7	Nasik	11:00 AM	Pune	2:00 PM
8	Nasik	3:00 PM	Pune	6:00 PM
9	Aurangabad	7:00 AM	Pune	11:00 AM
10	Aurangabad	3:00 PM	Pune	7:00 PM

d) i) What is a zero-sum game?
ii) Find the solution to the following game. [5]

-5	2	0	7
5	6	4	8
4	0	2	-3

e) An insurance company has three claims adjusters in its branch office. People with claims against company are found to arrive in a Poisson fashion, at an average rate of 20 per 8-hour day. The amount of time that an adjuster spends with a claimant is found to have and exponential distribution, with mean service time 40 minutes. Claimants are processed in order of their appearance.
i) How many hours a week can an adjuster expect to spend with claimants?
ii) How much time, on the average, does a claimant spend in the branch office? [5]

PART - B **5 ×10 Marks = 50**

2.a) Write a brief note on the origin of Operations Research.
b) Write four different areas of application of Operations Research.
c) What are the limitations of Operations Research? [4+3+3]

OR

3. The following table summarizes the key facts about two products, A and B, and resources Q, R and S, required to produce them.

Resource	Resource Usage per Unit Produced		Amount of Resource Available
	Product A	Product B	
Q	2	1	2
R	1	2	2
S	3	3	4
Profit per unit	3	2	

Formulate the model and solve it graphically. [10]

4. Consider the following problem,

$$Maximize\ Z = 2x_1 + 4x_2 + 3x_3$$

Subject to

$$3x_1 + 4x_2 + 2x_3 \leq 60$$
$$2x_1 + x_2 + 2x_3 \leq 40$$
$$x_1 + 3x_2 + 2x_3 \leq 80$$

And

$$x_1 \geq 0,\ x_2 \geq 0,\quad x_3 \geq 0.$$

Solve this problem using Simplex method. [10]

OR

5. Production manager of a company produces three types of spare parts for automobiles. The manufacturer of each part requires processing on each of two machines, with following processing times (in hours):

Machine	Part		
	A	B	C
1	0.02	0.03	0.05
2	0.05	0.02	0.04

Each machine is available 40 hours per month. Each part manufactured will yield a unit profit as follows:

	Part		
	A	B	C
Profit	5000	4000	3000

The manager wants to determine the mix of spare parts to produce in order to maximize total profit. [10]

6. The coach of a swim team has five best swimmers. In a 200-yard medley there are four different strokes. The coach needs to assign four best swimmers with best of their ability in the respective strokes so that the team can give its best performance. The data for the five fastest swimmers and their best times in seconds for 50 yards is given below:

Stroke	Rajesh	Dhruv	Nishant	Amol	Brijesh
Backstroke	37.7	32.9	33.8	27.0	35.4
Breaststroke	43.4	33.1	42.2	34.7	41.8
Butterfly	33.3	28.5	38.9	30.4	33.6
Freestyle	29.2	26.4	29.6	28.5	31.1

a) Formulate this problem as assignment problem.
b) Obtain an optimal solution. [10]

OR

7. Consider the following assignment problem of assigning four operators to four machines. The cost matrix is as follows:

		Machine			
		1	**2**	**3**	**4**
Operator	**1**	5	5	--	2
	2	7	4	2	3
	3	9	3	5	--
	4	7	2	6	7

Operator 1 cannot be assigned to 3. Similarly operator 3 cannot be applied to 4. Find the minimum cost. [10]

8. Daily demand for loaves of bread at a grocery store are given by the following probability distribution.

x	100	150	200	250	300
p(x)	0.20	0.25	0.30	0.15	0.10

If a loaf is not sold the same day, it can be disposed of at Re 1 at the end of the day. Otherwise the price of a fresh loaf is Rs. 11. The cost per loaf to the store is Rs. 2.50. Assuming stock level is restricted to one of the demand levels, how many loaves should be stocked daily? [10]

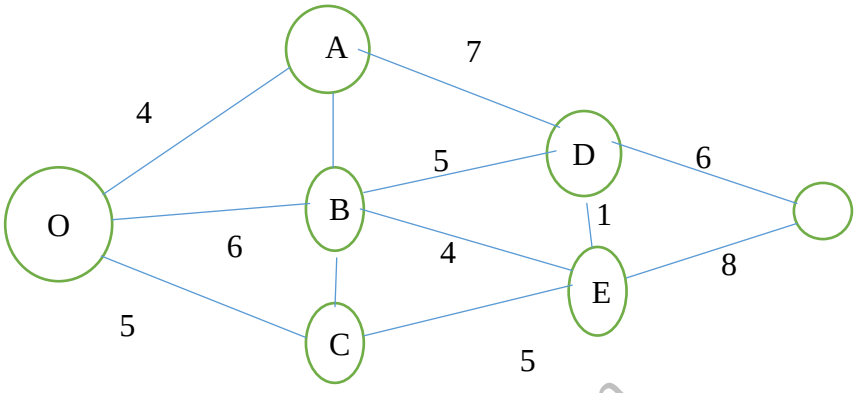
OR

9.a) Consider the game

		B		
		1	2	3
A	1	5	50	50
	2	1	1	0.1
	3	10	1	10

Verify that the strategies $(\frac{1}{6}, 0, \frac{5}{6})$ for player A and $(\frac{49}{54}, \frac{5}{54}, 0)$ for player B are optimal and find the value of the game.

b)



Find shortest path. [5+5]

10.a) Consider a typical barber shop. Demonstrate that it is a queuing system by describing its components.

b) Consider a single server queuing system with any service time distribution of interarrival times (GI/G/1) model. Use only basic definitions and relationships to verify the following relations:

i) $L = L_q + (1 - P_0)$

ii) $L = L_q + \rho$

iii) $L_0 = 1 - \rho$ [5+5]

OR

11.a) Explain why the utilization factor ρ for the server in a single-server queuing system must equal $1 - P_0$ where P_0 is the probability of having 0 customers in the system.

b) The jobs to be performed on a particular machine arrive according a Poisson input process with a mean rate of two per hour. Suppose that machine breaks down and will require 1 hour to be repaired. What is the probability that the numberof new jobs that will arrive during this time is (i) 0, (ii) 2, (iii) 5 or more? [5+5]

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