ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
M.Sc. MATHEMATICS-III SEMESTER
SEMESTER EXAMINATION_NOVEMBER-2020
MTDE9618: OPTIMIZATION TECHNIQUES

Time- - $2\frac{1}{2}$ Hours

Max Marks-70

This paper contains Three printed sides

ANSWER ANY SEVEN FULL QUESTIONS

1. G. J. Breweries Ltd have two bottling plants, one located at G and the other at J. Each plant produces three drinks, whisky, beer and brandy named A , B and C respectively. The number of the bottles produced per day are shown in the table.

Drink	Plant at	
	G	J
whisky	1500	1500
beer	3000	1000
Brandy	2000	5000

A market survey indicates that during the month of July, there will be a demand of 20,000 bottles of whiskey, 40,000 bottles of beer and 44,000 bottles of brandy. The operating cost per day for plants at G and J are 600 and 400 monetary units. Then

a) For how many days each plant be run in July so as to minimize the production cost, while still meeting the market demand?

b) Formulate this problem as an LP problem.

c) Solve that using graphical method.

[10m]

2. Solve by Simplex method the following LPP:

Maximize $Z = 16x_1 + 17x_2 + 10x_3$

subject to

$x_1 + x_2 + 4x_3 \leq 2000$

$2x_1 + x_2 + x_3 \leq 3600$

$x_1 + 2x_2 + 2x_3 \leq 2400$

$x_1 \leq 30$

and $x_1, x_2, x_3 \geq 0$

[10m]

3. a) Write down the difference between assignment problem and transportation Problem.

b) How should the jobs be allocated, one per employee, so as to minimize the total man hours. A department of a company has five employees with five jobs to be performed. The time(in hours) that each man takes to perform each job is given in the effectiveness matrix.

Employees

	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

Jobs (row labels A–E on the left of the table)

[2m+8m]

4. Determine a sequence of these jobs that will minimize that total elapsed time T and find idle time for machines A and B. There are seven jobs, each of which has to go through the machines A and B in the order AB. The processing times in hours are as follows:

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

[10m]

5. a) What is Replacement ? Describe some important replacement situations.

b) A Machine costs Rs 45,000 and its operating costs are estimated to be Rs.1,000 for the first year increasing by Rs.10,000 per year in the second and subsequent years. Determine the optimum period for the replacement of the machine.

[4m+6m]

6. Explain the following terms
   a) Saddle point in game theory
   b) Two person zero sum game with example
   c) Principles of dominance with example
   d) Pure strategy in game theory with example

[10m]

7. Solve the game whose payoff matrix is given below: What is the game value?

Player A	Player B			
	B1	B2	B3	B4
A1	3	2	4	0
A2	3	4	2	4
A3	4	2	4	0
A4	0	4	0	8

[10m]

8. Determine the optimal decision under each of the following decision criteria for the following data given:
   a) Maximin criterion b) Maximax criterion
   c) MiniMax regret criterion d) Laplace criterion

Strategies

States of nature	S1	S2	S3
N1	2000	3000	2500
N2	1200	800	1000
N3	1500	1000	1800

[10m]

9. An established company has decided to add a new product to its line. It will buy the product from a manufacturing concern, package it, and sell it to a number of distributors that have been selected on a geographical basis. Market research has already indicated the volume expected and the size of sales force required. The steps shown in the following table are to be planned.

Activity	Description	Predecessors	Duration (days)
A	Organise sales office	--	14
B	Hire salesman	A	4
C	Train salesman	B	2
D	Select advertising agency	A	1
E	Plan advertising campaign	D	2
F	Conduct advertising campaign	E	3
G	Design Package	--	2
H	Setup packaging facilities	G	4
I	Package initial stocks	J, H	3
J	Order stocks from manufacturer	--	12
K	Select Distributors	A	4
L	Sell to distributors	C, K	2
M	Ship stock from distributors	I, L	2

a) Draw an arrow diagram for this project.
b) Indicate the critical path.
c) What is the minimum completion time for the project?   [10m]

10. Arrivals at telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of phone calls is assumed to be distributed exponentially with a mean of 3 minutes.
    a) What is the probability that a person arriving at the booth will have to wait?
    b) What is the expected number of customer in the telephone booth and in the queue?
    c) How much time can a customer expect to spend in the telephone booth?
    d) Find the average time that a customer spends in the queue.   [10m]

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