

- b. Four machines to be assigned to four jobs. The cost matrix is given as follows. Find the proper assignment and total cost by Hungarian method. (08 Marks)

Machine \ Job	A	B	C	D
1	8	10	17	9
2	3	8	5	6
3	10	12	11	9
4	6	13	9	7

- 4 a. Explain the Branch and Bound method for Integer Programming. (05 Marks)
 b. Find the solution to the given LPP using Gomory's fractional cut technique.
 Maximize $Z = x_1 + x_2$
 Subject to $3x_1 + 2x_2 \leq 5$
 $x_2 \leq 2$
 x_1 and $x_2 \geq 0$ are integers. (15 Marks)

PART - B

- 5 a. For the following (i) Draw Activity on arrows. (ii) Find Total Float and Free Float.

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor	-	-	A	B	C	C	E	F, D	H, G	I
Time	10	8	8	16	7	7	10	12	8	5

- b. Crash the following project activities and find : (10 Marks)
 (i) Normal project duration and cost
 (ii) Optimum project duration and cost after crashing (10 Marks)

Activity		1-2	1-3	2-4	3-4
Normal	Time	8	4	2	5
	Cost	100	150	50	100
Crash	Time	6	2	1	1
	Cost	200	350	90	200

- 6 a. Explain queuing system. Also list and explain queue disciplines. (05 Marks)
 b. In a railway yard, goods trains arrive at a rate of 30 trains/day. Assuming inter arrival time follows an exponential distribution and service time also an exponential distribution with an average 36 minutes, calculate the following:
 (i) The mean queue size
 (ii) The probability the queue size exceeds 10
 If the input of trains increases to an average of 33 trains/day, what will be the change in (i) and (ii)? (10 Marks)
 c. What is Traffic Intensity and its unit? (05 Marks)
- 7 a. Explain the theory of dominance in a Game. (04 Marks)
 b. Obtain optimal strategies for both persons and value of the game for two persons zero sum game whose pay off matrix as follows:

		Player - B	
		B ₁	B ₂
Player - A	A ₁	1	-3
	A ₂	3	5
	A ₃	-1	6
	A ₄	4	1
	A ₅	2	2
	A ₆	-5	0

(08 Marks)

c. Two players A and B play a game in which each has three coins 5p, 10p and 20p. Each player selects the coin without the knowledge of other player. If sum of the coin is an odd number then 'A' with 'B's coin and if sum of the coin is an even number then B with A's coin. Find the strategy of each player and the value of the game. (08 Marks)

8 a. A machine operator has to perform three operations on number of different jobs. Determine the order of job and total elapsed time (hrs) with idle time of machines.

Machines ↓	Jobs					
	1	2	3	4	5	6
Turning (A)	5	14	7	4	11	13
Threading (B)	10	8	6	8	5	3
Knurling (C)	15	16	11	14	10	15

(10 Marks)

b. Find the optimum sequence of 2 jobs on 'M' machine (5 machines) using graphical method:

Job 1	Sequence	A	B	C	D	E
	Time	3	4	2	6	2
Job 2	Sequence	B	C	A	D	E
	Time	5	4	3	2	6

(10 Marks)
