## BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI (END SEMESTER EXAMINATION)

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CLASS: BRANCH	BTECH/BARCH : BT/CHEMICAL/MECH	I/CSE/	ECE/IT/AF	RCH				MESTE		023	
		ECT: I	PE332 OP	ERATION	RESEARCH	I WITH PY					
TIME:	3 Hours FUI								L MARKS: 50		
<ul> <li>INSTRUCTIONS:</li> <li>1. The question paper contains 5 questions each of 10 marks and total 50 marks.</li> <li>2. Attempt all questions.</li> <li>3. The missing data, if any, may be assumed suitably.</li> <li>4. Before attempting the question paper, be sure that you have got the correct question paper.</li> <li>5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.</li> </ul>											
Q.1(a) Q.1(b)	Write a Python program to check if a given input of a year is a leap year or not. [5] 1							BL 3 3			
Q.2(a)	day. Both X and Y require the same production capacity. The firm has a permanen contract to supply at least 2 tonnes of X and at least 3 tonnes of Y per day to anothe company. Each tonne of X requires 20 machine hours of production time and each tonne of Y requires 50 machine hours of production time. The daily maximum possible numbe of machine hours is 360. All of the firm's output can be sold. The profit made is Rs 80 per tonne of X and Rs 120 per tonne of Y. Formulate this problem as an LP model and solve it by using the graphical method to determine the production schedule that yield the maximum profit.						- - - - -	2	3		
Q.2(b)	Use the Big-M method to solve the following LP problem. Minimize $Z = 5x_1 + 3x_2$						[5]	2	3		
	Subjected to: $2x_1 + 4x_2 \le 12$										
	$2x_1 + 2x_2 = 10$										
	$5x_1 + 2x_2 \ge 10$										
	$x_1, x_2 \ge$	0									
Q.3(a)	A dairy firm has three plants located in a state. The daily milk production at each plant is as follows: Plant 1: 6 million litres, Plant 2: 1 million litres, and Plant 3: 10 million litres Each day, the firm must fulfil the needs of its four distribution centres. The minimum requirement of each centre is as follows: Distribution centre 1: 7 million litres, Distribution centre 2: 5 million litres, Distribution centre 3: 3 million litres, and Distribution centre 4: 2 million litres Cost (in hundreds of rupees) of shipping one million litre from each plant to each distribution centre is given in the following table: Distribution centres							1	3	3	
		P1	D1 2	D2 3	D3	D4	1				
	Plants	P1 P2	2 1	0	6	1	-				
	Find the initial basis fo	P3	5 solution f	8 for given r	15 problem by	9	] Iowing mothodor				
	Find the initial basic fe (a) North-west corner r		SOLUCION	or given p	ловчени ру	using rol	towing methods:				

(a) North-west corner rule

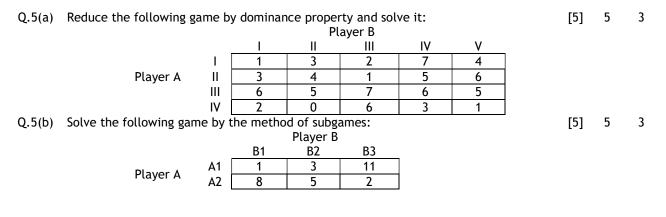
(b) Least cost method

(c) Vogel's approximation method

Q.3(b) A salesman wants to visit cities A, B, C, D, and E. He does not want to visit any city [5] 3 3 twice before completing his tour of all cities and wishes to return to the point of starting the journey. The cost of going from one city to another (in rupees) is shown in the table. Find the least-cost route.

	Α	В	С	D	Е
Α	0	2	5	7	1
В	6	0	3	8	2
С	8	7	0	4	7
D	12	4	6	0	5
Е	1	3	2	8	0

- Q.4(a) Arrivals of machinists at a tool store are considered to be Poisson distributed at an [4] 4 3 average rate 6 per hour. The length of time the machinists must remain at the tool store is exponentially distributed, with an average time of 0.05 hours.
  - a) What is the probability that a machinist arriving at the tool crib will have to wait?
  - b) What is the average number of machinists at the tool store?
  - c) The company will install a second tool store when convinced that a machinist would have to spend 6 minutes in waiting and being served at the tool store. At what rate should the arrival of machinists to the tool store increase to justify the addition of a second store?
- Q.4(b) A warehouse has only one loading dock manned by three person crew. Trucks arrive at [6] 4 3 the loading dock at an average rate of 4 trucks per hour and the arrival rate is Poisson distributed. The loading of a truck takes 10 minutes on an average and can be assumed to be exponentially distributed. The operating cost of a truck is Rs 20 per hour and the members of the loading crew are paid Rs 6 each per hour. Would you advise the truck owner to add another crew of three persons?



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