KONERU LAKSHMAIAH EDUCATION FOUNDATION
(Deemed to be University, Estd. u/s. 3 of UGC Act 1956)

B.Tech - Odd Sem : End Semester Exam
Academic Year:2020-2021

19CS2104 - Mathematical Programming-1

Set No: 1

Time: **Max.Marks: 100**

S.NO	Answer All Questions	Choice	Options	Marks	CO
1.	A hotel has requested a manufacturer to produce pillows and blankets for their room service. For materials, the manufacturer has 750 m² of cotton textile and 1,000 m² of silk. Every pillow needs 2 m² of cotton and 1 m² of silk. Every blanket need 2 m² of cotton and 5 m² of silk. The price of the pillow is fixed at $5 and the blanket is fixed at $10. Formulate the problem using mathematical modeling of LPP and define the objective function. What is the number of pillows and blankets that the manufacturer must give to the hotel so that these items obtain a maximum sale?	choice Q-2		10Marks	CO1
2.	The tactical border bomber squadron receives orders to disrupt the rival tank fabrication. In different towns the opponent has four major plants, if any one of the plant is destructed then the production come to halt. The fuel available for the mission is only 45,000 liters. In the least, a bomber flies to a specific city should have a minimum fuel enough for a complete round trip and an additional 100 liters of fuel is required. To optimise the likelihood of success, how many of each type of bombers should be dispatched, and howshould they be distributed among the four targets?Formulate the linear Programming. The number of bombers available to the commander and their descriptions, are as follows: Bomber type | Description | Km/litre | Number available A | Heavy | 2 | 40 B | Medium | 2.5 | 30 Information about the location of the plants and their probability of being attacked by a medium bomber and a heavy bomber is given below: Plant | Distance from base (km) | Probability of destruction by A heavy bomber | Probability of destruction by A medium bomber A | Heavy | 2 | 40 B | Medium | 2.5 | 30			10Marks	CO1
3.	Original Model Maximize: P=x1-x2+3x3 Subject To: X1+x2<=20 X1+x3=5 X2+x3>=10 X1,x2,x3>=0 Modified Problem Maximize: P=x1-x2+3x3-Ma1-Ma2 Subject To: X1+x2+s1=20 X1+x3+a1=5 X2+x3-s2+a2=10 X1,x2,x3,s1,s2,a1,a2>=0 Solve using BigM method.	choice Q-4		15Marks	CO1
4.	A new airline has determined to enroll in the market. It is thinking about supplying flights out of Phoenix, AZ, and would initially like to travel to a three distinct locations: San Diego, San Francisco, and Las Vegas. The distances of every roundtrip flight going out of Phoenix are (approximately): 720 miles, 1500 miles, and 1140 miles, respectively. The enterprise would like to use the slogan, “the average price per flight is by no means more than $200.” As for costs, it anticipates flights to San Diego will run about 10% of airfare. Similarly, San Francisco will run 12% and Las Vegas will run 14% of airfare. The agency wishes to make certain that the overall average fee isn't any more than 10% of earned airfare. Recent marketplace research permits the business enterprise to finish that it is able to probably promote about 1900 San Diego tickets, 700 San Francisco tickets, and 1000 Las Vegas ticket. Under these conditions and assuming that all tickets offered are round-experience flights, how much ought to the employer charge consistent with ticket that allows you to maximize its overall revenue? Solve the problem simplex method.			15Marks	CO1
5.	Differentiate Primal and Dual in linear programming. Give an example for how to convert from Primal to Dual.	choice Q-6		10Marks	CO2
6.	An individual on a high protein, low carbohydrate diet requires at least 100 units of protein and most 24 units of carbohydrates daily. The diet will consist entirely of three special liquid diet foods, A, B and C. The contents and costs of the diet foods are given below. How many bottles of each brand of diet food should be consumed daily in order to meet the protein and carbohydrate requirements at minimum cost? What is the minimum cost? Find the solution using dual method.			10Marks	CO2
7.	A enterprise manufactures two products X and Y on 3 machines Turning, Milling and finishing machines. Each unit of X takes, 10 hours of turning device capacity, five hours of milling machine potential and 1 hour of finishing system potential. One unit of Y takes 6 hours of turning machine ability, 10 hours of milling gadget capacity and 2 hours of finishing machine capability. The organization has 2500 hours of turning gadget capability, 2000 hours of milling device capability and 500 hours of completing gadget ability in the coming planning period. The income contribution of product X and Y are Rs. 23 in keeping with unit and Rs. 32 per unit respectively. Formulate the linear programming problem for Primal and Dual.	choice Q-8		15Marks	CO2
8.	The physician advises a patient visited him that the patient is weak in his health due to scarcity of two vitamins, ie, vitamin X and vitamin Y. He advises him to take as minimum 40 units of diet X and 50 units of Vitamin Y every day. He additionally advises that these vitamins are to be had in two tonics A and B. Each unit of tonic A includes 2 units of nutrition X and 3 gadgets of vitamin Y. Each unit of tonic B consists of 4 units of diet X and 2 units of nutrition Y. Tonic A and B are available inside the medical shop at a price of Rs. three in step with unit of A and Rs. 2,50 in line with unit of B. The patient has to meet the want of nutrition by ingesting A and B at a minimum fee. Mention whose problem is Primal and Dual. Formulate accordingly and give the solution for Primal and Dual.			15Marks	CO2
9.	Four different jobs are to be done on four different machines. The setup and production times are prohibitively high for changeover. The following table indicates the cost of producing job I on machine j in rupees. Assign jobs to different machines so that total cost is minimized.	choice Q-10		10Marks	CO3

		Machines							
	Jobs	1	2	3	4				
	J1	5	7	11	6				
	J2	8	5	9	6				
	J3	4	7	10	7				
	J4	10	4	8	3				
10.	Explain the following in context of Transportation Problem: a) Stepping Stone Method b) Modified Distribution Method							10Marks	CO3
11.	A manufacturer of electronic calculators produces its goods in Dallas, Chicago, and Boston, and maintains regional warehousing distribution centers in Philadelphia, Atlanta, Cleveland, and Washington, D.C. The company's staff has determined that shipping costs are directly proportional to the distances from factory to storage center, as listed here. a) Usethe Column minimum method to arrive at an initial feasible solution. b) Show that the feasible solution determined in (a) is optimal.						choice Q-12	15Marks	CO3
	Mileage/ Warehouses	Philadelphia	Atlanta	Cleveland	Washington				
	Boston	300	1000	500	400				
	Chicago	500	900	300	600				
	Dallas	1300	1000	1100	1200				
	The cost per calculator-mile is $0.0002 and supplies and demands are:								
	Supply	Demand							
	Boston 1500	Philadelphia 2000							
	Chicago 2500	Atlanta 1600							
	Dallas 4000	Cleveland 1200							
		Washington 3200							
12.	The Indiana tobacco company purchases tobacco and stores in warehouses located in the following four cities:							15Marks	CO3
	Warehouse	Capacity(Tons)							
	Delhi	90							
	Kolkata	50							
	Ahmadabad	80							
	Chennai	60							
	The warehouse supply tobacco to cigarette companies situated at three cities that have the following demand:								
	Cigarette company	Demand(tons)							
	Bharat	120							
	Janata	100							
	Red Lamp	110							
	The railroad shipping cost per ton are given below:								
	From/To	Bharat	Janata	Red lamp					
	Delhi	7	10	5					
	Kolkata	12	9	4					
	Ahmadabad	7	3	11					
	Chennai	9	5	7					
	Because of railroad construction, shipments are temporally prohibited from Warehouse at Delhi to Bharat Cigarette company. Find the optimal distribution cost for Indiana tobacco company.								
13.	The following knapsack problem: Maximize Xn j=1 cx j, subject to: Xn j=1 2x j ≤ n, x j = 0 or 1 (j = 1, 2, . . . , n), Which has the same ''contribution'' for each item under consideration, has proved to be rather difficult to solve for most generalpurpose integer-programming codes when n is an odd number. a) What is the optimal solution when n is even? When n is odd? b) Comment specifically on why this problem might be difficult to solve on general integer-programming codes when n is odd.						choice Q-14	10Marks	CO4
14.	What is integer linear programming? Explain the merits and demerits of 'rounding-off' a continuous optimal solution to an LP problem in order to obtain an integer solution.							10Marks	CO4
15.	Consider the capital budgeting problem where five projects are being considered for execution over the next 3 years. The expected returns for each project and the yearly expenditures (in thousands of rupees) are shown in table. Assume that each approved project will be executed over the 3 year period. The objective is to select a combination of projects that will maximize the total returns. Formulate but not solve the mathematical programming problem.						choice Q-16	15Marks	CO4

		Expenditure for					
		Project	Year 1	Year 2	Year 3	Returns	
		1	5	1	8	20	
		2	4	7	10	40	
		3	3	9	2	20	
		4	7	4	1	15	
		5	8	6	10	30	
		Maximum available funds	25	25	25		
16.	Solve the following linear programming problem using Branch and Bound Method: Maximize Z=3x1+ 2x2 Subject to 2x1+5x2 ≤ 9 4x1+ 2x2 ≤ 9 x1, x2 ≥ 0 and integers					15Marks	CO4

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