Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CS365

Course Name: OPTIMIZATION TECHNIQUES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1 State any three typical applications of optimization techniques 3

2 Customers arrive at a booking office window, being manned by a single individual at the rate of 25 / hour. Time required to serve a customer has exponential distribution with a mean of 120 seconds. Find the average waiting time of customers. 3

3 Which are the essential features of optimization problems 3

4 Locate the stationary points of $f(x) = x^3 - 3x + 2$ and find out whether the function is convex, concave or neither at the points of optima 3

PART B

Answer any two full questions, each carries 9 marks.

5 a) The research department of consumer products division has recommended to the marketing department to the marketing department to launch a soap with 3 different perfumes. The marketing manager has to decide the type of perfume to launch under the following sales. Estimate which type can be chosen under i) Maximax, ii) Minimax, iii) Maximin, iv) Laplace v) Hurwiczalpha criteria (α = .6) 6

Types of perfume ↓	Estimated levels of sales unit		
	20000	10000	2000
I	250	15	10
II	40	20	5
III	60	25	3

b) Explain the method of finding the area of an irregular shape region by montecarlo simulation 3

6 a) Find the interval of concavity and convexity and find points of inflection , if any, of $f(x) = x^3-6x^2-3x+1$ 6

b) What is the physical meaning of decision variables in optimization problems? Give a particular example. 3

7 a) What are the steps involved in the decision making problem 5

b) A dealer wishes to purchase a number of fans and sewing machines. He has only Rs.5760 to invest and has space atmost for 20 items. A fan costs him Rs.360 and a sewing machine Rs.240. His expectation is that he can sell a fan at a profit of Rs.22 and a sewing machine at a profit of Rs.18. Assuming that he can sell all the items that ha can buy, how should he invest his money in order to maximize his profit? Formulate the mathematical model 4

PART C

Answer all questions, each carries 3 marks.

8 Maximize by Dichotomous method: $f(x) = x \sin \pi x$, $1.5 \leq x \leq 2.5$. Assume that $\Delta = 0.3$ 3

9 Determine the extreme points using Hessian matrix 3

$f(X) = x^3 + y^3 - 3xy$

10 Find the initial basic feasible solution to the following transportation problem by Least-cost method 3

	A	B	C	D	Availability
I	1	5	3	3	34
II	3	3	1	2	15
III	0	2	2	3	12
IV	2	7	2	4	19
Requirement	21	25	17	17	

11 Write the general mathematical model of an assignment problem 3

PART D

Answer any two full questions, each carries 9 marks.

12 a Using Simplex method , Minimize $z = x_1 - 3x_2 + 2x_3$, subject to 5

$3x_1 - x_2 + 2x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$ and $x_1 , x_2 , x_3 \geq 0$

12 b A company produces two products A and B . The sales volume for A is at least 80 % of the total sales of both A and B. However the company cannot sell more than 110 units of A per day. Both products use one raw material of which the maximum daily availability is 240lb. The usage rate of the raw material are 2lb per unit of A and 4lb per unit of B . The profit units for A and B are \$10 and \$25 respectively. Determine the optimal product mix for the company, using graphical method . 4

13 Solve the following transportation problem :Use Vogel approximation for initial b.f.s 9

	1	2	3	4	supply
1	**190**	**300**	**500**	**100**	70
2	**700**	**300**	**400**	**600**	90
3	**400**	**100**	**600**	**200**	180
demand	50	80	70	140	

14 a) Minimize $f(X) = 100(y-x^2)^2 + (1-x)^2$ with initial point $X_0 = (0,0)$ using steepest ascent method (or any gradient method). Carry out 4 iterations 5

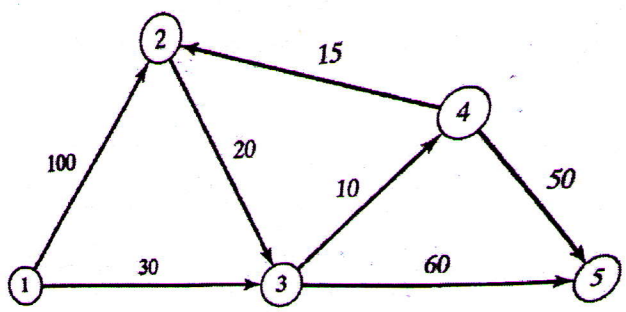
b) Solve the following assignment problem for minimizing the cost. 4

	I	II	III	IV
A	32	26	35	38
B	27	24	26	32
C	28	22	25	34
D	10	10	16	16

PART E

Answer any four full questions, each carries 10 marks.

15 a) The following network gives the permissible routes and their lengths in miles between city1 (node1) and 4 other cities (nodes 2-5). Determine the shortest route between city 1 and each of the remaining 4 cities. 6



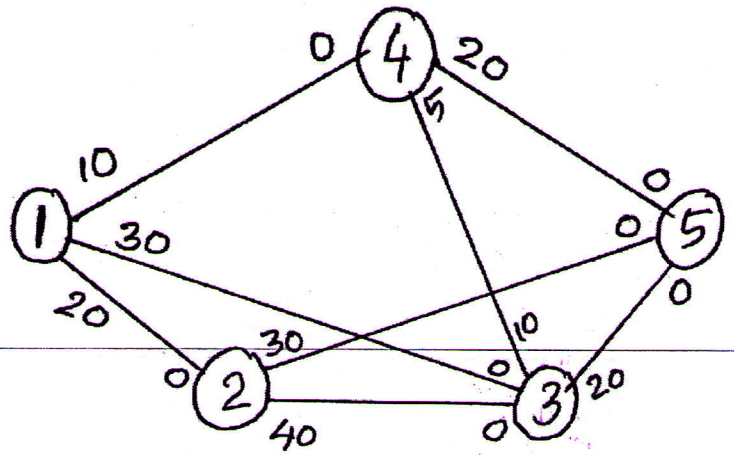
b) Distinguish between NP-Complete and NP-Hard problems 4

16 a) Write the summary of Tabu Search algorithm 4

b) Which are the two criterion for improving the quality of the final solution obtained using Tabu Search algorithm 3

c) What is meant by short term and long term memory in Tabu Search 3

17 Find the maximum flow in the following network. Also find the flow in the individual arcs ? 10



18 Draw the flow chart of a binary G A and explain different steps 10

19 a) Suppose that GA is used to find the maximum of f(x), x = 0,1,….., 275. Let x = 107 and x = 254 represent parents P_1 and P_2.Given 0.6712 , 0.1926 , 0.2567 , 0.4651(Use these numbers ,if required , in the given order) 4

a) Represent P_1 and P_2 as binary codes

b) Use uniform crossover to create off springs C_1 and C_2

c) Create the off springs $C_1$and C_2 using a1-point cross over(after 3rd bit)

d) Create the off springs $C_1$and C_2 using a2-point cross over(use 3rd and 4th random number)

b) Write the simulated annealing algorithm for the travelling sales man problem 6

20 a) Write the genetic algorithm for the travelling sales man problem 5

b) A book salesperson who lives in Basin must call once a month on four customers located in Wald, Bon, Mena, and Kiln before returning home to Basin. The following table gives the distances in miles among the different cities. 5

Miles between cities					
	Basin	Wald	Bon	Mena	Kiln
Basin	0	125	225	155	215
Wald	125	0	85	115	135
Bon	225	85	0	165	190
Mena	155	115	165	0	195
Kiln	215	135	190	195	0

The objective is to minimize the total distance travelled by the sales person. Write down the linear program for computing a lower bound estimate on the optimum tour length

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