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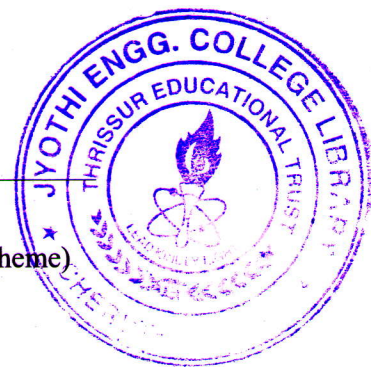
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree (S,FE) Examination January 2022 (2015 Scheme)

Course Code: CS365

Course Name: OPTIMIZATION TECHNIQUES

Max. Marks: 100　　　　　　　　　　　　　　　　　　　　　　　　　Duration: 3 Hours

PART A
Answer all questions, each carries 3 marks.
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　Marks

1　Growfast Company is evaluating four alternative single-period investment opportunities　(3)
whose returns are based on the state of economy. There is a chance of 20% fair economy,
50% good economy and 30% great economy. The returns (in Rs. 1000) for each
investment opportunity and each state of economy are as follows:

Alternative	State of economy		
	Fair	Good	Great
W	1.0	3.0	6.0
X	0.5	4.5	6.8
Y	0.0	5.0	8.0
Z	-4.0	6.0	8.5

Using the decision-tree approach, determine the expected return for each alternative.
Which alternative proposal would you recommend?

2　State true or false, justify: Monte Carlo Simulation tells not only what could happen, but　(3)
also how likely it is to happen.

3　What do you mean by continuous optimization? Give at least two examples of it.　(3)

4　Define convex function. Prove that $f(x) = \cos x$ is a convex function in $\left(\dfrac{\pi}{2}, \dfrac{3\pi}{2}\right)$.　(3)

PART B
Answer any two full questions, each carries 9 marks.

5　a)　Define the following: (i) interarrival time (ii) reneging (iii) parallel server (iv) Kendall's　(4)
notation

　b)　Give any 5 applications of optimization techniques.　(5)

6　a)　Consider the following Cost matrix with alternatives, A_1, A_2, A_3 and A_4 and states of　(6)
nature, S_1, S_2, S_3 and S_4. Determine the best among alternatives using

　　(i) Laplace (ii) Minimax (iii) savage/regret criterion (iv) Hurwicz criterion ($\alpha = 0.25$).

Alternative	States of nature			
s	S_1	S_2	S_3	S_4
A_1	5	10	18	25
A_2	8	7	12	23
A_3	21	18	12	21
A_4	30	22	19	15

b) What are the reasons behind external constraint? Give any three. (3)

7 a) What is internal constraint? Give some valid ideas to tackle internal constraints. (4)

b) Explain operating cost and role optimization reducing operating cost. (5)

PART C
Answer all questions, each carries 3 marks.

8 What is the necessary and sufficient condition for optimum of unconstrained problem with single variable? (3)

9 Find the minimum of the function $f(x) = x^5 - 5x^3 - 20x + 5$ by unrestricted search with step size of 0.2 starting from $x = 0$. (3)

10 Determine an initial feasible solution to the following transportation problem using north-west corner rule. (3)

	Destination				Supply
	1	2	3	4	
1	8	10	12	17	100
2	15	13	18	11	150
3	14	20	6	10	180
4	13	19	7	5	210
Demand	160	170	100	210	

(Source)

11 Consider the following assignment problem, where the objective is to minimize the cost. (3)

	J_1	J_2	J_3
W_1	7	4	1
W_2	4	6	7
W_3	5	4	6

Draw the network representation of this assignment problem. Formulate this problem as a LPP model.

PART D
Answer any two full questions, each carries 9 marks.

12 A department store wishes to purchase the following quantities of sarees (9)

Types of Sarees	A	B	C	D	E
Quantity	150	100	75	250	200

Tenders are submitted by four different manufacturers who undertake to supply not more than the quantities mentioned below (all types of sarees combined)

Manufacturer	1	2	3	4
Total quantity	300	250	150	200

Unit shipping costs in Rupees are

Sarees

Manufacturer	A	B	C	D	E
1	275	350	425	225	150
2	300	325	450	175	100
3	250	350	475	200	125
4	325	275	400	250	175

Find the initial feasible solution by Vogel's approximation method and determine the optimum distribution for the company.

13 a) Five workers, W_1, W_2, W_3, W_4 and W_5, are available to work with machines, M_1, M_2, (4)
M_3, M_4, M_5 and M_6, and the respective costs (in Rs.) associated with each worker-machine assignment are given below. A sixth machine (M_6) is available to replace one of the existing ones and associated costs are also given below:

|	M_1	M_2	M_3	M_4	M_5	M_6
W_1	12	3	6	-	5	9
W_2	4	11	-	5	-	8
W_3	8	2	10	9	7	5
W_4	-	7	8	6	12	10
W_5	5	8	9	4	6	1

Determine optimal assignment and the associated saving cost. Will the sixth machine replace any machine? If yes, which one?

b) Use the graphical method to solve this problem: min $Z = 3x + 2y$ subject to (5)
$x + 2y \leq 12$, $2x + 3y = 12$, $2x + y \geq 8$, where $x, y \geq 0$.

14 Solve the LPP using Big M method: min $Z = 3x + 4y + 5z$, subject to, $x + y \leq 10$, (9)
$x + 3y + z \geq 9$, $y + z \geq 4$ and $x, y, z \geq 0$

PART E

Answer any four full questions, each carries 10 marks.

15 Using Floyd Warshall's Algorithm find shortest path, with distance, (10)
(i) from 1 to 7 (ii) from 6 to 5.
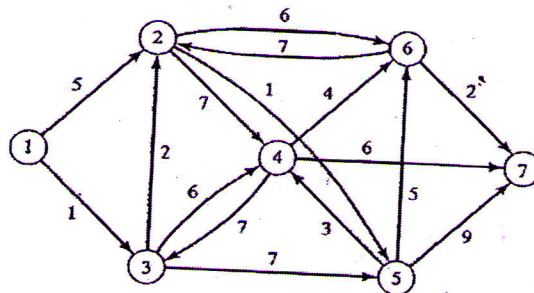
16 a) State true or false, justify: (6)

(i) Tabu search is a traditional algorithm.

(ii) NP is a the set of all decisions problem which cannot be solved by polynomial-time algorithm.

(iii) NP - hard is subset of NP.

b) Outline the similarities and differences between Genetic Algorithms and Evolutionary Strategies. (4)

17 a) Determine the maximum flow from Node A to Node K. (5)
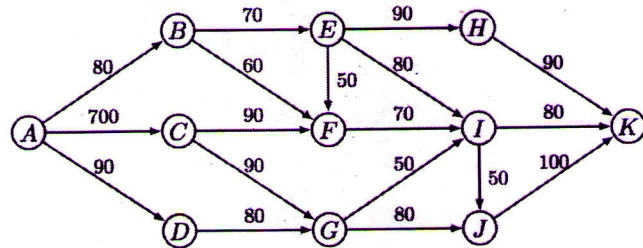
b) Define NP class problem. How NP-hard differ from NP-complete? Give appropriate examples for each. (5)

18 a) What is the role of Metropolis acceptance criterion in simulated annealing? (4)

b) Explain the solution process of Simulated annealing with a diagram. (6)

19 What do you mean by Job scheduling problem? Write procedure to solve job scheduling problem using Genetic algorithm. (10)

20 a) What are the important components of Tabu search? Draw diagram connecting all these components and show solution process. (4)

b) Explain any 3 types of crossover process in Genetic algorithm, with examples. (6)

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