Q.P. Code:23HS0852

R23

SIDDHARTH INSTITUTE OF ENGINEERING &TECHNOLOGY : PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583
QUESTION BANK (DESCRIPTIVE)
Subject with Code: OPTIMIZATION TECHNIQUES (23HS0852)

Branches: Common to CAI,CSM,CSIT branches of B.Tech
Year & Sem: II-B.Tech & II-Sem **Regulation: R23**

UNIT –I
INTRODUCTION

1	a) Define Nature and Scope of OR	[L1] [CO1]	**[2M]**
	b) Define Standard form of LPP	[L1] [CO1]	**[2M]**
	c) Define Optimization	[L1] [CO1]	**[2M]**
	d) Define basic Feasible Solution	[L1] [CO1]	**[2M]**
	e) Define Slack and Surplus Variable	[L1] [CO1]	**[2M]**
2	a) Formulation of Linear Programing Problem	[L6] [CO1]	**[5M]**
	b) Limitations of Linear Programing Problem	[L2] [CO1]	**[5M]**
3	Solve the following Linear Programming Problem using Graphical method. Minimize $Z = 2x_1 + 3x_2$ Subject to $x_1 + x_2 \geq 6$ $7x_1 + x_2 \geq 14$ $x_1 \; and \; x_2 \geq 0$	[L3] [CO1]	**[10M]**
4	Solve the following Linear Programming Problem using Graphical method. Maximixe $Z = 6x_1 + 8x_2$ Subject to $5x_1 + 10x_2 \leq 60$ $4x_1 + 4x_2 \leq 40$ $x_1 \; and \; x_2 \geq 0$	[L3] [CO1]	**[10M]**
5	(a) Explain the procedure for Solving the LPP using Graphical method.	[L2] [CO1]	**[5M]**
	(b) Explain the procedure for Solving the LPP using simplex method.	[L2] [CO1]	**[5M]**
6	Solve the following Linear Programming Problem using Simplex method. Maximize $Z = 10x_1 + 15x_2 + 20x_3$ Subject to $2x_1 + 4x_2 + 6x_3 \leq 24$ $3x_1 + 9x_2 + 6x_3 \leq 30$ $x_1, x_2 \; and \; x_3 \geq 0$	[L3] [CO1]	**[10M]**
7	Solve the following Linear Programming Problem using Simplex method. Minimize $Z = 8x_1 - 2x_2$ Subject to $-4x_1 + 2x_2 \leq 1$ $5x_1 - 4x_2 \leq 3$ $x_1 \; and \; x_2 \geq 0$	[L3] [CO1]	**[10M]**

8	Solve the following Linear Programming Problem using Big-M method. Minimize $Z = 2x_1 + 3x_2$ Subject to $x_1 + x_2 \geq 6$ $7x_1 + x_2 \geq 14$ $x_1 and\ x_2 \geq 0$	[L3] [CO1]	**[10M]**
9	Solve the following Linear Programming Problem using Big-M method. Maximize $Z = 6x_1 + 4x_2$ Subject to $2x_1 + 3x_2 \leq 30$ $3x_1 + 2x_2 \leq 24$ $x_1 + x_2 \geq 3$ $x_1 and\ x_2 \geq 0$	[L3] [CO1]	**[10M]**
10	(a) Explain the procedure for Solving the LPP using Big-M method.	[L2] [CO1]	**[5M]**
	(b) Explain the procedure for Solving the LPP using Two phase method.	[L2] [CO1]	**[5M]**
11	Solve the following Linear Programming Problem using Two Phase method. Min $Z = 12x_1 + 18x_2 + 15x_3$ Subject to $4x_1 + 8x_2 + 6x_3 \geq 64$ $3x_1 + 6x_2 + 12x_3 \geq 96$ $x_1, x_2 and\ x_3 \geq 0$	[L3] [CO1]	**[10M]**

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UNIT –II
TRANSPORTATION PROBLEM

1	(a) Write the mathematical form of Transportation Problem.	[L1] [CO2]	**[2M]**
	(b) Define Basic Feasible Solution.	[L1] [CO2]	**[2M]**
	(c) What is an Degeneracy Transportation Problem.	[L1] [CO2]	**[2M]**
	(d) State the difference between Transportation problem and Assignment problem	[L2] [CO2]	**[2M]**
	(e) What is mean by Unbalanced in Assignment Problem.	[L1] [CO2]	**[2M]**
2	(a) Explain the procedure for North West Corner rule (NWCR)	[L2] [CO2]	**[5M]**
	(b) Explain the procedure for Least Cost Method (LCM)	[L2] [CO2]	**[5M]**
3	(a) Explain the procedure for Vogel's Approximation Method (VAM)	[L2] [CO2]	**[5M]**
	(b) Explain the procedure Unbalanced and Maximization Transportation Problem	[L2] [CO2]	**[5M]**
4	Explain the procedure for Degeneracy Transportation Problem	[L2] [CO2]	**[10M]**
5	(a) Obtain the initial basic feasible solution by using NWCR to the following Transportation Problem	[L5] [CO2]	**[5M]**
	(b) Obtain the initial basic feasible solution by using LCM to the following Transportation Problem	[L5] [CO2]	**[5M]**
6	(a) Obtain the initial basic feasible solution by using VAM to the following Transportation Problem	[L5] [CO2]	**[5M]**
	(b) Find Optimum basic feasible solution to the following Transportation problem.	[L1] [CO2]	**[5M]**

	D_1	D_2	D_3	Availability
O_1	2	7	4	5
O_2	3	3	1	8
O_3	5	4	7	7
O_4	1	6	2	14
Require	7	9	18	

	D_1	D_2	D_3	D_4	Availability
O_1	6	8	8	8	30
O_2	5	9	7	9	40
O_3	8	7	13	6	50
Require	35	28	32	25	

	D_1	D_2	D_3	D_4	Supply
O_1	3	1	7	4	300
O_2	2	6	5	9	400
O_3	8	3	3	2	500
Demand	250	350	400	200	

	D_1	D_2	D_3	D_4	Supply
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	

7 Find the intial basic feasible solution using NWCR,LCM,VAM and compare total costs [L1] [CO2] **[10M]**

	M1	M2	M3	M4	M5	Supply
P1	10	2	16	14	10	300
P2	6	18	12	13	16	500
P3	8	4	14	12	10	825
P4	14	22	20	8	18	375
Demand	350	400	250	150	400	

8 Solve the following Transportation Problem [L3] [CO2] **[10M]**

	D_1	D_2	D_3	D_4	Availabilites
O_1	8	10	7	6	50
O_2	12	9	4	7	40
O_3	9	11	10	8	30
Require	25	32	40	23	

9 (a) Write the mathematical formulation of the assignment problem [L1] [CO2] **[5M]**

(b) Explain about Hugarian algorithm for solving an assignment problem. [L2] [CO2] **[5M]**

10 (a) There are four jobs A,B,C and D these are Performed on 4 machines1,2,3,4. One job is allocated through a machine.the cost of each job on machine is given below in the following matrix [L5] [CO2] **[5M]**

	I	II	III	IV
A	15	14	12	16
B	23	22	25	24
C	31	34	32	33
D	21	32	44	53

(b) A company has four salesman targeted at four cities.the profit per day in rupees for each salesman in each city is given below.find the assignment of salesman to various cities which maximses the total profit [L5] [CO2] **[5M]**

	SALESMAN			
	1	2	3	4
CITIES A	16	10	14	11
B	14	11	15	15
C	15	15	13	12
D	13	12	14	15

11 Solve the following assignment problem [L3] [CO2] **[10M]**

	MACHINES			
	1	2	3	4
JOBS A	18	24	28	32
B	8	13	17	19
C	10	15	19	22

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UNIT –III
SEQUENCING

1 (a)Define sequencing. [L1] [CO3] **[2M]**

(b)Define Idle time on a machine. [L1] [CO3] **[2M]**

(c)Define total elapsed time. [L1] [CO4] **[2M]**

(d)Define processing time. [L1] [CO4] **[2M]**

(e) Write assumptions of sequencing. [L1] [CO4] **[2M]**

2 Explain the johnsons algorithm for n jobs and two machines. [L2] [CO3] **[10M]**

3 We have five jobs,each of which must go through two machines A and B in the order AB.Processing the times(in hours) are givn below [L5] [CO3] **[10M]**

JOBS	1	2	3	4	5
MACHINE A	5	1	9	3	10
MACHINE B	2	6	7	8	4

4 Six jobs go first over machine I and then over the machine II. The following table gives the machine times in hours for six jobs and the two machines. [L5] [CO3] **[10M]**

JOBS	1	2	3	4	5	6
Time on MACHINE I	5	9	4	7	8	6
Time on MACHINE II	7	4	8	3	9	5

5 Explain the johnsons algorithm for n jobs and three machines. [L2] [CO3] **[10M]**

6 Find the optimum sequence of the jobs on three machines A,B and C in the order ABC which minimizes the total elapsed time.also find idle time for machines A,B and C the Processing times are given below [L1] [CO4] **[10M]**

Jobs	Processing times (in hours)		
	Machine A	Machine B	Machine C
1	8	3	8
2	3	4	7
3	7	5	6
4	2	2	9
5	5	1	10
6	1	6	9

7 Find the sequence for the following eight jobs that will minimize the total elapsed time for the completion of all jobs.each job is processed in the same order CAB [L1] [CO4] **[10M]**

Jobs / machines	1	2	3	4	5	6	7	8
A	4	6	7	4	5	3	6	2
B	8	10	7	8	11	8	9	13
C	5	6	2	3	4	9	15	11

8 (a) Explain the johnsons algorithm for n jobs through m machines. [L2] [CO4] **[5M]**

(b)Explain the johnsons algorithm for Two jobs through m machines. [L2] [CO4] **[5M]**

9 Four jobs are to be processed on each of the 5 machines find the total minimum elapsed time if no passing of jobs is permitted also find the idle time for each [L5] [CO4] **[10M]**

machine

MACHINE	JOBS			
	1	2	3	4
A	7	6	5	8
B	5	6	4	3
C	2	4	5	3
D	3	5	6	2
E	9	10	8	6

10 Four jobs 1,2,3 and 4 are to be processed on each of the five machines A,B,C,D and E in the order ABCD.find the total minimum elapsed time if no passing of jobs is permitted also determine idle time for each machine [L5] [CO4] **[10M]**

Machine / jobs	A	B	C	D	E
1	14	10	4	6	18
2	12	12	8	10	20
3	10	8	10	12	16
4	16	6	6	4	12

11 Using Graphical method,Determine the optimal sequence needed to process job 1 and 2 on five machines A,B,C,D and E for each machine find the job which should be done first.Also calculate the total time needed to complete both the job

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

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UNIT –IV
GAME THEORY

1	a) Define GAME theory	[L1] [CO5]	**[2M]**
	b) Define Saddle point	[L1] [CO5]	**[2M]**
	c) Define Payoff matrix	[L1] [CO5]	**[2M]**
	d) Define Two person zero sum game	[L2] [CO5]	**[2M]**
	e) Define mixed strategy & pure strategy	[L1] [CO5]	**[2M]**
2	a) Determine the optimal strategy for company A and company B Company B 1 2 3 Company A 1 [20 15 22] 2 [35 45 40] 3 [18 20 25]	[L1] [CO5]	**[5M]**
	b) Algorithm to determine mixed strategy for 2×2 pay off matrix player B 1 2 $playerA$ 1 $[a \quad b]$ 2 $[c \quad d]$	[L1] [CO5]	**[5M]**
3	(a)Consider the given payoff matrix with respect to player A and solve it optimally Player B 1 2 $player\ A$ 1 [6 9] 2 [8 4]	[L5] [CO5]	**[5M]**
	(b) Explain about dominance properties Row and column	[L1] [CO5]	**[5M]**
4	Player A and B play a game in which each player has three coins (20p,25p and 50p) each of them selects a coin without the knowledge of the other person.if the sum of the values of the coin is an even number,A wins B'scoin.if the sum of an odd number B wins A's coin (a)Develop a payoff matrix with respect to player A (b)Find the optimal strategies for the players	[L5] [CO5]	**[10M]**
5	Consider the 4×4 game played by palyers A and B and slove it optimally Player B 1 2 3 4 Player A 1 [6 2 4 8] 2 [2 −1 1 12] 3 [2 3 3 9] 4 [5 2 6 10]	[L5] [CO5]	**[10M]**
6	Solve the following 3×5 game using dominance property Player B 1 2 3 4 5 $player\ A$ 1 [2 5 10 7 2] 2 [3 3 6 6 4] 3 [4 4 8 12 1]	[L1] [CO5]	**[10M]**
7	(a)Algorithm for slove the 2×n game using graphical method	[L3] [CO5]	**[5M]**
	(b) Algorithm for slove the m×2 game using graphical method	[L3] [CO5]	**[5M]**

8	Consider the payoff matrix of player A and slove it optimally using graphical method Player B $\begin{matrix} & 1 & 2 & 3 & 4 & 5 \\ Player\ A\ 1 & 3 & 0 & 6 & -1 & 7 \\ 2 & -1 & 5 & -2 & 2 & 1 \end{matrix}$	[L3] [CO5]	**[10M]**
9	Consider the payoff matrix of player A and slove it optimally using graphical method Player B $\begin{matrix} & 1 & 2 \\ 1 & 1 & 3 \\ 2 & 3 & 1 \\ Player\ A\ 3 & 5 & -1 \\ 4 & 6 & -6 \end{matrix}$	[L1] [CO5]	**[10M]**
10	Represents the payoff matrix with respect to player A solve it optimally using LPP Player B $\begin{matrix} & 1 & 2 & 3 \\ 1 & 1 & -1 & -1 \\ \text{Player A}\ 2 & -1 & -1 & 3 \\ 3 & -1 & 2 & -1 \end{matrix}$	[L5] [CO5]	**[10M]**
11	Consider a game in which the payoff matrix of the player A.slove this game optimally using linear programming Player B $\begin{matrix} & 1 & 2 & 3 \\ 1 & 6 & 8 & 2 \\ \text{Player A}\ 2 & 8 & 2 & 10 \\ 3 & 4 & 10 & 12 \end{matrix}$	[L5] [CO5]	**[10M]**

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UNIT –V
PROJECT MANAGEMENT

1 (a)Define Total float. [L1] [CO6] **[2M]**

(b)Define Free float. [L1] [CO6] **[2M]**

(c)Define Optimistic time. [L1] [CO6] **[2M]**

(d)Define Most likely time. [L2] [CO6] **[2M]**

(e)Define Pessimistic time. [L1] [CO6] **[2M]**

2 (a)Construct a Network for the project whose activities and precedence relationship are as given below [L1] [CO6] **[5M]**

Activites	A	B	C	D	E	F	G	H	I
predecessor	-	A	A	-	D	B,C,D	F	D	G,H

(b) Construct a network for each of the project whose activities and their predence Relationship are given below [L1] [CO6] **[5M]**

Activity	A	B	C	D	E	F	G	H	I	J	K
predecessor	-	-	-	A	B	B	C	D	E	H,I	F,G

3 Consider the following data for the activities of a project [L5] [CO6] **[10M]**

Activity	A	B	C	D	E	F	G	H	I	J
Immediate predecessor	-	-	A,B	A,B	B	C	D	F,G	F,G	E,H
Duration (Weeks)	4	3	2	5	6	4	3	7	4	2

Draw the network and find the critical path and also find various floats.

4 Consider the following data for the activities of a project [L1] [CO6] **[10M]**

Activity	A	B	C	D	E	F
Immediate predecessor	-	A	A	B,C		E
Time	2	3	4	6	2	8

Draw the Network and find the critical path and also find various floats.

5 Draw the network diagram and identify critical path for the following data. [L5] [CO6] **[10M]**

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-7	5-8	6-8	7-9	8-9	9-10
Time (weeks)	2	2	2	4	5	8	4	2	4	5	3	4

6 Draw the network diagram and identify critical path for the following data. [L1] [CO6] **[10M]**

Activity	1-2	1-3	1-4	2-5	3-4	3-7	4-6	5-7	6-7
Time (Days)	20	23	8	19	16	24	18	18	10

7 The following table shows the jobs of a project with their duration in days draw the the network and determine the critical path.Also calculate all the floats [L3] [CO6] **[10M]**

Activity	1-2	1-3	1-4	2-5	3-7	4-6	5-7	5-8	6-7	6-9	7-10	8-10	9-10	10-11	11-12
Days	10	8	9	8	16	7	7	7	8	5	12	10	15	8	5

8 A Project consists the following activities and Different Estimate times [L5] [CO6] **[10M]**

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	1	7	13
1-6	2	5	14
2-3	2	14	26
2-4	2	5	8
3-5	7	10	19
4-5	5	5	17
6-7	5	8	29
5-8	3	3	9
7-8	8	17	32

Draw the project network and find probability of the project completing in 40 days

9 A project consists the following activities and different Estimate times [L1] [CO6] **[10M]**

Activity	1-2	2-3	2-4	3-4	3-5	4-5	5-6
O	1	1	2	1	2	2	3
M	1	4	2	1	5	5	6
P	7	7	8	1	14	8	15

Draw PERT diagram and find the Critical path

10 Consider the following table summarizing the details of a project [L5] [CO6] **[10M]**

Activity	predecessor	Duration(weeks)		
		O	M	P
A	-	5	6	7
B	-	1	3	5
C	-	1	4	7
D	A	1	2	3
E	B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E,F	4	4	10
I	D	2	5	8
J	H,G	2	2	8

(i)construct the project network
(ii)find the critical path and expected project completion time
(iii)what is the probability of completing the project on or before 22 weeks

11 (a) Explain the procedure for CPM [L5] [CO6] **[5M]**

(b) Expain the procedure for PERT [L5] [CO6] **[5M]**