Hall Ticket No | | | | | | | | | | | Question Paper Code: AHS012

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

MODEL QUESTION PAPER- II

Four Year B.Tech V Semester End Examinations (Regular) - November, 2019

Regulation: IARE – R16

OPTIMIZATION TECHNQUES

Time: 3 Hours **(Common to CSE | IT |EEE)** **Max Marks: 70**

Answer ONE Question from each Unit All
Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) What are various methods involved in solving problems with artificial variables? Explain steps involved in two phase method. [7M]

(b) Solve the following LPP by using graphical method

Maximize Z=3x1+4x2

Subject to

$x_1+x_2 \leq 450$

$x_1+2x_2 \leq 600$

where $x_1, x_2 \geq 0$ [7M]

2. (a) Explain the algorithm of simplex method to solve an LPP with an example. [7M]

(b) Solve the following LPP by using Big M method [7M]

Minimize Z=12x1+20x2

Subject to

$6x_1+8x_2 \geq 100$

$7x_1+12x_2 \geq 120$

where $x_1, x_2 \geq 0$

UNIT – II

3. (a) Explain steps involved in the Hungarian Method for solution of assignment problem. [7M]

(b) A Company has three plants at locations A,B and C which supply to warehouses located at D,E,F, G and H, monthly plant capacities are 800,500and900respectively. Monthly warehouse requirements are400,500,400and800unitsrespectively.Unittransportation cost in rupees are given below. Determine an optimum distribution for the company in order to minimize the transportation cost by NWCR.[7M]

	D	E	F	G	H
A	5	8	6	6	3
B	4	7	7	6	5
C	8	4	6	6	4

4 (a) Why Vogel's approximation method provide a good initial feasible solution than other methods? Explain with an example. [7M]

(b) Different machines can do any of the five required jobs, with different profits resulting from each assignment as shown in the adjusting table. Find out maximum profit possible through optimal assignment. [7M]

Jobs	Machines				
	A	B	C	D	E
1	30	37	40	28	40
2	40	24	27	21	36
3	40	32	33	30	35
4	25	38	40	36	36
5	29	62	41	34	39

UNIT – III

5 a) What are the conditions to be satisfied to convert a 'n' jobs 3 machine problem into 'n' jobs 2 machine problem? Explain the method clearly? [7M]

b) Solve the following Game theory problem by graphical method [7M]

$$\begin{array}{cc} & \begin{array}{cc} B1 & B2 \end{array} \\ \begin{array}{c} A1 \\ A2 \\ A3 \\ A4 \end{array} & \begin{bmatrix} -2 & 0 \\ 3 & -1 \\ -3 & 2 \\ 5 & -4 \end{bmatrix} \end{array}$$

6 a) State rules for game theory and also explain what are the characteristics of a two-person zero-sum game? [7M]

b) Calculate the following sequencing problem to minimize the time elapsed with sequence [7M]

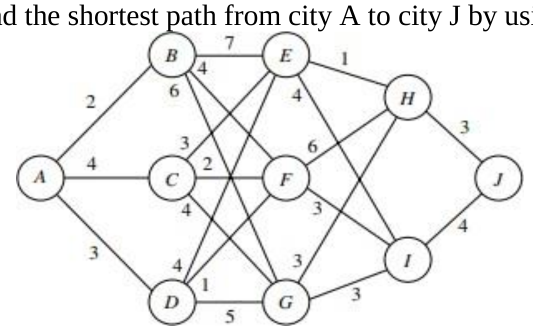
M &M2					
Job	1	2	3	4	5
Machine M1	7	10	8	9	7
Machine M2	2	1	4	0	5

Also find the total elapsed time and idle times of each machine.

UNIT – IV

7 a) Explain about formulation of dynamic programming problem with appropriate equations. [7M]

b) Find the shortest path from city A to city J by using dynamic programming technique. [7M]



8 a) State Bellman's principle of optimality and explain applications of dynamic programming. [7M]

b) Use dynamic programming to solve the above LPP Problem [7M]

Maximize $z = 8x_1 + 7x_2$

subject to

$2x_1 + x_2 \leq 8$,

$5x_1 + 2x_2 \leq 15$,

where $x_1, x_2 \geq 0$

UNIT – V

9 a) Compare and contrast features of sub problem generated by Direct quadratic approximation and Quadratic approximation of langrangian function. [7M]

b) Solve the problem using the direct successive quadratic programming (QP) strategy [7M]

Minimize $f(x) = 6x_1 x_2^{-1} + x_2 x^{-2}$

subject to

$h(x) = x_1 x_2 - 2 = 0$

$g(x) = x_1 + x_2 - 1 >= 0$

From the initial feasible estimate $x^0 = (2, 1)$.

10 a) Suppose the CVM algorithm were employed with a problem involving a quadratic objective function and quadratic inequality constraints. How much iteration is likely to be required to solve the problem, assuming exact arithmetic? What assumptions about the problem are likely to be necessary in making this estimate? [7M]

b) Solve the problem using the Lagrangian quadratic programming (QP) strategy [7M]

Minimize $f(x) = 6x_1 x_2^{-1} + x_2 x_1^{-2}$

Subject to

$h(x) = x_1 x_2 - 2 = 0$

$g(x) = x_1 + x_2 - 1 >= 0$

From the initial feasible estimate $x^0 = (2, 1)$, u=0 and v=0.

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I. COURSE OBJECTIVES:
The course should enable the students to:

S.No	Description
I	Learn fundamentals of linear programming through optimization.
II	Understand theory of optimization methods and algorithms developed for solving various types of optimization problems.
III	Apply the mathematical results and numerical techniques of optimization theory to concrete Engineering Problems.
IV	Understand and apply optimization techniques to industrial applications
V	Apply the dynamic programming and quadratic approximation to electrical and electronic problems and applications.

II. COURSE LEARNING OUTCOMES:
Students who complete the course will have demonstrated the ability to do the following

AHS012.01	Explain the various characteristics and phases of linear programming.
AHS012.02	Formulate the various linear programming problems by using graphical and simplex methods
AHS012.03	Understand the artificial variable techniques like two phase and Big-M methods.
AHS012.04	Explain Transportation problem and the formulation of the problem by using optimal solution.
AHS012.05	Solve the assignment problems by using optimal solutions and the variance of assignment problems.
AHS012.06	Describe the travelling sales man problem.
AHS012.07	Explain the sequencing and the types of sequencing methods.
AHS012.08	Use n jobs through two machines and n jobs through three machines to solve an appropriate problem.
AHS012.09	Use two jobs through m machines to solve an appropriate problem.
AHS012.10	Understand theory of games and the terminologies used in theory of games concept.
AHS012.11	Determine appropriate technique to solve to a given problem.
AHS012.12	Solve the problems by using dominance principle and Graphical method.
AHS012.13	Understand the Bellman's principle of optimality.
AHS012.14	Describe heuristic problem-solving methods.
AHS012.15	Understand the mapping of real-world problems to algorithmic solutions.
AHS012.16	List out the various applications of dynamic programming.
AHS012.17	Define the shortest path problem with approximate solutions.
AHS012.18	Explain the linear programming problem with approximate solutions.
AHS012.19	Define the various quadratic approximation methods for solving constraint problems.

AHS012.20	Explain the direct quadratic approximation for solving the constraint problems.
AHS012.21	Explain the quadratic approximation method by using lagrangian function.
AHS012.22	Describe the variable metric methods for constrained optimization.

MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES

SEE Question No.		Course learning Outcomes		Blooms Taxonomy Level
1	a	AHS012.01	Explain the various characteristics and phases of linear programming..	Understand
	b	AHS012.02	Formulate the various linear programming problems by using graphical and simplex methods	Understand
2	a	AHS012.03	Understand the artificial variable techniques like two phase and Big-M methods.	Remember
	b	AHS012.02	Formulate the various linear programming problems by using graphical and simplex methods	Understand
3	a	AHS012.06	Describe the travelling sales man problem.	Understand
	b	AHS012.04	Explain Transportation problem and the formulation of the problem by using optimal solution.	Understand
4	a	AHS012.05	Solve the assignment problems by using optimal solutions and the variance of assignment problems.	Remember
	b	AHS012.05	Solve the assignment problems by using optimal solutions and the variance of assignment problems.	Understand
5	a	AHS012.08	Use n jobs through two machines and n jobs through three machines to solve an appropriate problem.	Remember
	b	AHS012.08	Use n jobs through two machines and n jobs through three machines to solve an appropriate problem.	Remember
6	a	AHS012.10	Determine appropriate technique to solve to a given problem.	Understand
	b	AHS012.11	Determine appropriate technique to solve to a given problem.	Remember
7	a	AHS012.15	List out the various applications of dynamic programming.	Remember
	b	AHS012.17	Define the shortest path problem with approximate solutions.	Understand
8	a	AHS012.18	Explain the linear programming problem with approximate solutions..	Remember
	b	AHS012.18	Explain the linear programming problem with approximate solutions.	Understand
9	a	AHS012.19	Define the various quadratic approximation methods for solving constraint problems	Understand
	b	AHS012.21	Explain the quadratic approximation method by using lagrangian function.	Remember
10	a	AHS012.20	Explain the direct quadratic approximation for solving the constraint problems.	Understand
	b	AHS012.22	Describe the variable metric methods for constrained optimization.	Understand

HOD, CSE