Printed page: 3 Subject Code: ACSBS0401

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute)

Affiliated to Dr. A.P. J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow

Course: B.Tech. Branch: CSBS

Semester IV Sessional Examination - II Year- (2021- 2022)

Subject Name: Operations Research

Time: 1.15 Hours **[SET- B]** **Max. Marks:30**

General Instructions:

- This Question paper consists of 3 pages & 5 questions. It comprises of three Sections, A, B, and C
- Section A -Question No- 1 is objective type questions carrying 1 mark each, Question No- 2 is very short answer type carrying 2 mark each. You are expected to answer them as directed.
- Section B - Question No-3 is Short answer type questions carrying 5 marks each. Attempt any two out of three questions given.
- Section C - Question No. 4 & 5are Long answer type (within unit choice) questions carrying 6 marks each. Attempt any one part *a* or *b*.

		SECTION – A	**[08Marks]**	
1.	**All questions are compulsory**		**(4×1=4)**	
	a.	The dual simplex method is applicable to the LPP's that start with i. An infeasible but optimum solution ii. An infeasible solution iii. A feasible but optimum solution iv. A feasible solution	**(1)**	**CO2**
	b.	If dual has unbounded solution, primal has i. An infeasible solution ii. An unbounded solution **iii.** A feasible solution **iv.** None of the above.	**(1)**	**CO2**
	c.	The purpose of the transportation approach for locational analysis is to minimize i. total costs ii. total shipping costs	**(1)**	**CO3**

		iii. total variable costs iv. total fixed costs		
	d.	The solution to a transportation problem with 'm' rows(supplies) and 'n' columns(destination) is feasible if number of positive allocations are **i.** m+n **ii.** mn iii. m+n-1 **iv.** m+n+1	**(1)**	**CO3**
2.	**All questions are compulsory**		**(2×2=4)**	
	a.	State Fundamental Duality Theorem.	**(2)**	**CO2**
	b.	Write the mathematical form of transportation Problem.	**(2)**	**CO3**
		SECTION – B	**[10Marks]**	
3.	**Answer any <u>two</u> of the following-**		**(2×5=10)**	
	a.	Define convex set. Prove that the set $S = \{(x_1, x_2) \mid x_1^2 + x_2^2 \leq 4\}$ is a convex set.	**(5)**	**CO2**
	b.	Solve the assignment problem represented by the following matrix	**(5)**	**CO3**

	a	b	c	d	e	f
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

	c.	Determine an initial basic feasible solution to the following transportation problem using Vogel's method.	**(5)**	**CO3**

	D_1	D_2	D_3	D_4	Available
O_1	1	2	1	4	30
O_2	1	3	2	1	50
O_3	4	2	5	9	20
Required	20	40	30	10	100

	SECTION – C	**[12Marks]**	
4	**Answer any <u>one</u> of the following-**	**(1×6=6)**	

	a.	Use dual simplex method to solve the problem: $Min.\ Z = 6x_1 + x_2$ subject to constraints $2x_1 + x_2 \geq 3,$ $x_1 - x_2 \geq 0,$ $x_1, x_2 \geq 0$	**(6)**	**CO2**
	b.	Use Big-M method to Maximize $z = x_1 + 5x_2$ Subject to $3x_1 + 4x_2 \leq 6$ $x_1 + 3x_2 \geq 2$ $x_1, x_2 \geq 0$	**(6)**	**CO2**
5.	**Answer any <u>one</u> of the following-**		**(1×6=6)**	
	a.	Solve the following transportation problem (cell entries represent unit costs): Available 5 3 7 3 8 5 3 5 6 12 5 7 11 4 2 1 3 4 8 2 2 9 6 10 5 10 9 8 Required 3 3 6 2 1 2 17	**(6)**	**CO3**
	b.	Solve the following unbalanced transportation problem (symbols have their usual meaning): D_1 D_2 D_3 a_i O_1 4 3 2 10 O_2 2 5 0 13 O_3 3 8 6 12 b_j 8 5 4	**(6)**	**CO3**