Hall Ticket Number:

Code No. : 16516 (B)

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Mech. Engg. : CBCS) VI-Semester Main Examinations, January-2021

Operations Research

(Elective-I)

Time: **2** hours Max. Marks: **60**

*Note: Answer any **NINE** questions from **Part-A** and any **THREE** from **Part-B***

Part-A (9× 2 = 18 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define Basic and non-basic solution.	2	1	1	1
2.	How do you identify the degenerate solution in LPP by using simplex method?	2	1	1	1
3.	Differentiate between simplex and dual simplex method.	2	1	2	1
4.	Write the dual form for the following L.P.P Maximize $z = 6x_1 + 10x_2 + 13x_3$ subjected to conditions $3x_1 + 4x_2 + x_3 \geq 9$ $2x_2 + 4x3 \leq 8$ $x_1, x_2, x_3 \geq 0$	2	3	2	2
5.	How to solve an unbalanced transportation problem?	2	1	3	1
6.	With reference to Transportation problem what is non degenerate BFS?	2	2	3	1
7.	Explain the role of PWF in replacement problem	2	3	4	1
8.	Describe the calculus method of solving a 2x2 game.	2	1	4	5
9.	Define Jockeying and collusion.	2	3	5	1
10.	List various sequencing methods employed in a single machine and n jobs	2	1	5	2
11.	How do you identify a case of multiple solutions of a given LPP	2	3	1	2
12.	If a given primal problem yields unbounded solution, What shall be the dual?	2	3	2	2
	Part-B (3 × 14 = 42 Marks)				
13.	Solve the following LPP by simplex method Maximize $Z= 5X_1+8X_2$, subject to the constraints: $3X_1+2X_2 \geq 3$, $X_1+4X_2 \geq 4$, $X_1+X_2 \leq 5$ and $X_1, X_2, \geq 0$	14	2	1	2

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14.	Write the dual of the following problem and then solve it by dual simplex method Maximize $Z= 6X_1+4X_2$ S.T.C $2X_1+3X_2 \leq 30$ $3X_1+2X_2 \leq 24$ all variables positive	14	4	2	2
15.	Find the optimal solution for the following transportation problem	14	4	3	2
16.	A machine costs Rs 5000 and the maintenance cost of n th year is 500(n-1) where n=1,2,... Find the best age to replace if the discount rate is 5%.	14	3	4	4
17. a)	Customers arrive at a store at a rate of 30 per hour, housed with a single counter of service serving at a rate of 45 per hour. It is estimated that each extra minute of system process time per customer done at an additional cost of Rs1.50. Another assistant can be given such that the counter can serve 85 customers per hour. Find optimal serving rate to minimize customer waiting cost and justify the hiring of an assistant	7	4	5	4
b)	Find optimal sequence for the following problem and also find minimum elapsed time show idle time in bar-chart. So job to be processed in the order of M1 and M2.	7	4	5	4
18. a)	Solve the following LPP by graphical method Maximize Z=10x1+4x2 S.T.C $x1+x2 \leq 20$ $4x1+x2 \leq 40$ $x1,x2, \geq 0$	7	2	1	4
b)	Mention different post optimality cases in LPP. How these cases are useful for product based industry.	7	2	2	1
19.	Answer any ***two*** of the following:				
a)	Explain the nature of travelling salesman problem and give its mathematical formulation	7	2	3	4
b)	Explain LPP method of solving a two person zero sum game	7	2	4	2
c)	List the steps in the solution of a 2 machine and n job sequencing problem	7	2	5	1

	D1	D2	D3	D4	supply
F1	6	2	1	0	10
F2	4	2	2	3	20
F3	3	1	2	1	45
Demand	10	20	30	15	

Job No	1	2	3	4	5	6	7	8	9
M1 (Hr)	2	7	8	10	6	8	5	9	10
M2 (Hr)	6	3	4	9	8	2	3	3	12

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	65
2	Knowledge on application and analysis (Level-3 & 4)	35
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	-

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