Hall Ticket Number:

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VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Mech. Engg.) VI-Semester Main & Backlog Examinations, May/June-2023

Operations Research (PE-I)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Define linear programming problem.	2	1	1	1,2,3
2.	What is an unbounded solution?	2	1	1	1,2,3
3.	How do you resolve degeneracy if occurs while solving by simplex method	2	2	2	1,2,3
4.	What is the significance of economic interpretation in duality?	2	1	2	1,2,3
5.	What is an unbalanced transportation problem?	2	1	3	1,2,3
6.	What is meant by restricted (or prohibited) assignment?	2	1	3	1,2,3
7.	Differentiate gradual failures and sudden failures	2	1	4	1,2,3
8.	Define "saddle point" in game theory.	2	1	4	1,2,3
9.	List any four assumptions made in solving sequencing problem	2	1	5	1,2,3
10.	What are waiting line costs?	2	1	5	1,2,3
	Part-B (5×8 = 40 Marks)				
11.	Use Big –M simplex method to maximize $Z = 5x - 2y + 3z$ Subject to $2x + 2y - z \geq 2$ $3x - 4y \leq 3$ $y + 3z \leq 5$ Where x, y, z are non-negative variables	8	4	1	1,2,3
12. a)	Explain the principles of duality in simplex method with appropriate example.	4	2	2	1,2,3
b)	Differentiate Simplex and Dual simplex methods.	4	2	2	1,2,3
13.a)	Five workmen have to be assigned to repair five machines. The assignment costs are given in the following table below	6	4	3	1,2,3

Machines/ Workers	Lathe	Milling	Jig Boring	Shearing	SPM
Ramu	5	5	-	2	6
Kishore	7	4	2	3	4
Prasad	9	3	5	-	3
Sandeep	7	2	6	7	2
Pradeep	6	5	7	9	1

Ramu cannot repair Jig boring machine and Prasad cannot repair Shearing machine. Find the optimal assignment schedule.

Contd... 2

b)	List the various methods to find the initial basic feasible solution of a transportation problem.	2	1	3	1,2,3
14. a)	A factory has a large number of bulbs all of which must be in working condition. The mortality of bulbs is given in the following table :	4	4	4	1,2,3

Week	Proportion of Bulbs Failing During the Week
1	0.1
2	0.15
3	0.25
4	0.35
5	0.12
6	0.03

If a bulb fails in service, it costs 3.50 to replace but if all bulbs are replaced at a time it costs Rs. 1.20 each. Find the optimum group replacement policy. (Assume 1000 bulbs as available in the beginning).

b) Solve the following game theory problem. — 4 4 4 1,2,3

	Player B				
Player A	16	4	0	14	-2
	10	8	6	10	12
	2	6	4	8	14
	8	10	2	2	0

15. There are six jobs, each of which must go through machines A,B and C. Processing time (in hours) are given in the following table — 8 4 5 1,2,3

Job	*1*	*2*	*3*	*4*	*5*	*6*
Machine A	12	10	9	14	7	9
Machine B	7	6	6	5	4	4
Machine C	6	5	6	4	2	4

Order of the processing of each job is ACB. Find the optimal sequence.

If the sequence suggested is 5-3-6-2-1-4, is it optimal? Also, find the total time elapsed for the sequence suggested.

16. a) A teacher gives his students three long lists of problems with the instructions to submit not more than 100 of them correctly solve, for credit. The problems in the First list are of 5 points each, in second 4 points each and in third 6 points each. On an average 3 minutes are required to solve a problems from first list, 2 min. for a problem from second & 4 min. for a problem from third. The students devote more than 2½ hours of numerical hours. How many problems from each list, a student should solve so as to get the maximum credit. Formulate the problems as LPP. — 4 4 1 1,2,3

Contd... 3

b)	Describe how you can identify infeasible, unique, multiple, unbounded solutions in simplex method	4	2	2	1,2,3
17.	Answer any ***two*** of the following:				
a)	Calculate the initial basic feasible solution of a give transportation problem using least cost method.	4	3	3	1,2,3

	Destinations				Supply
Origins	2	3	11	7	6
	1	0	6	1	1
	5	8	15	9	10
Demand	7	5	3	2	

b)	What is 'strictly determined game'? When the game is said to be determinable?	4	2	4	1,2,3
c)	In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to dump a train) distribution is also exponential with an average of 36 minutes; calculate expected queue size (line length).	4	4	5	1,2,3

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	22.5%
iii)	Blooms Taxonomy Level – 3 & 4	57.5%

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