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Code No. : 16531 (A) AS

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD**

Accredited by NAAC with A++ Grade

**B.E. (Mech. Engg.) VI-Semester Advance Supplementary Examinations, August-2022****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.	What is meant by degeneracy in simplex?	2	1	1	1																									
2.	Give the structure of linear programming problems (LPPs) with an example.	2	2	1	1																									
3.	Distinguish between the terms of primal and dual of simplex.	2	1	2	1																									
4.	What do you understand by post optimal analysis?	2	1	2	1																									
5.	Give the applications of assignment problems.	2	2	3	1																									
6.	What is balanced transportation problem?	2	1	3	1																									
7.	Define saddle point.	2	1	4	1																									
8.	What are the costs involved in failure and replacement analysis of equipment?	2	1	4	1																									
9.	Brief out various queue configurations.	2	1	5	1																									
10.	Define sequencing.	2	1	5	1																									
<b>Part-B (5×8 = 40 Marks)</b>																														
11.(a)	Solve the following LPP using Simplex method Maximize $Z=40x_1 + 50x_2$ Subject to $2x_1 + 3x_2 \leq 30$ $8x_1 + 4x_2 \leq 45$ $x_1, x_2 \geq 0$	6	4	1	4																									
11.(b)	Show unbounded solution in graphical method.	2	3	1	4																									
12. a)	'The dual of a dual' is 'primal'. Explain this statement with an example.	5	4	2	4																									
b)	What are the advantages and applications of duality?	3	2	2	4																									
13.a)	ABC agency transports material from one place to the other on commission basis. The following are the estimated commissions per unit of material to be transported from the plants P <sub>1</sub> , P <sub>2</sub> , and P <sub>3</sub> to market centers M <sub>1</sub> , M <sub>2</sub> and M <sub>3</sub> . Optimize the commissions to be earned by the agency (note that there is no route available to transport from P <sub>2</sub> to M <sub>1</sub> )	6	4	3	4																									
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>M<sub>1</sub></th> <th>M<sub>2</sub></th> <th>M<sub>3</sub></th> <th>Supply</th> </tr> </thead> <tbody> <tr> <th>P<sub>1</sub></th> <td>6</td> <td>9</td> <td>8</td> <td>120</td> </tr> <tr> <th>P<sub>2</sub></th> <td>-</td> <td>4</td> <td>2</td> <td>80</td> </tr> <tr> <th>P<sub>3</sub></th> <td>11</td> <td>5</td> <td>4</td> <td>80</td> </tr> <tr> <th>Demand</th> <td>150</td> <td>70</td> <td>60</td> <td>280</td> </tr> </tbody> </table>							M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	Supply	P <sub>1</sub>	6	9	8	120	P <sub>2</sub>	-	4	2	80	P <sub>3</sub>	11	5	4	80	Demand	150	70	60	280
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b)	Define travelling sales men problem.	2	2	3	4																									

14. a)	A and B play a game in which each has three coins a 5P, a 10P and 20P. Each selects a coin without the knowledge of the others choice. If the sum of the coins is an odd amount, A wins B's coins. If the sum is even B wins A's coins. Find the best strategy for each player and the value of the game.	6	4	4	4																			
b)	Write the applications of game theory.	2	2	4	4																			
15.a)	A T.V. repairman finds that the time spent on his jobs have an exponential distribution with mean of 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately Poisson distribution with an average rate of 10 per 8 hour day, what is repairmen's expected idle time each day? How many jobs are ahead of the average set just brought in?	5	4	5	4																			
b)	Explain the assumptions in sequencing.	3	2	5	4																			
16. a)	Loha and Co. produces an alloy of specific gravity 0.98 with chromium content not more than 8% and melting point below 500°C. Three raw materials $M_1$ , $M_2$ and $M_3$ are used to manufacture this alloy. The properties of these materials are as follows:	4	4	1	4																			
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">Property</th> <th colspan="3">Property of raw material</th> </tr> <tr> <th><math>M_1</math></th> <th><math>M_2</math></th> <th><math>M_3</math></th> </tr> </thead> <tbody> <tr> <td>Specific gravity</td> <td>0.92</td> <td>0.97</td> <td>1.04</td> </tr> <tr> <td>Chromium content</td> <td>7%</td> <td>13%</td> <td>16%</td> </tr> <tr> <td>Melting point</td> <td>440°C</td> <td>490°C</td> <td>480°C</td> </tr> </tbody> </table>		Property	Property of raw material			$M_1$	$M_2$	$M_3$	Specific gravity	0.92	0.97	1.04	Chromium content	7%	13%	16%	Melting point	440°C	490°C	480°C				
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The cost of each raw material is computed as the product of other two quantities of raw materials used to produce the alloy. Formulate an LPP to determine the proportions that will minimize the total costs.																								
b)	Explain various types of the solutions of Linear Programming problems how they appear while solving by graphical method.	4	2	2	4																			
17.	Answer any <i>two</i> of the following:																							
a)	Explain how you get multiple solutions in assignment problems.	4	2	3	4																			
b)	Write a note on replacement policy when money value is changing with time.	4	2	4	4																			
c)	Explain the rules of sequencing n jobs when there are three machines to process.	4	2	5	4																			

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

i)	Blooms Taxonomy Level – 1	20
ii)	Blooms Taxonomy Level – 2	37.5
iii)	Blooms Taxonomy Level – 3 & 4	42.5

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