

Enrollment No: \_\_\_\_\_

Exam Seat No: \_\_\_\_\_

# C.U.SHAH UNIVERSITY

## Summer Examination-2019

Subject Name: Operations Research (OR)

Subject Code: 5CS04MOR1

Branch: MCA

Semester :4

Date : 15/04/2019

Time : 02:30 To 05:30

Marks :70

**Instructions:**

- (1) Use of Programmable calculator and any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

SECTION – I			
<b>Q-1</b>		<b>Attempt the Following questions (</b>	<b>(07)</b>
	<b>a.</b>	What is OR?	<b>1</b>
	<b>b.</b>	Write full Form of LPP	<b>1</b>
	<b>c.</b>	Define Terms : Slack Variables and Objective Function	<b>2</b>
	<b>d.</b>	What is Artificial variable	<b>1</b>
	<b>e.</b>	Write any two features of OR	<b>2</b>
<b>Q-2</b>		<b>Attempt all questions</b>	<b>(14)</b>
	<b>1</b>	Solve following LP Problem Using Graphical Method $\text{Max } Z=15X_1+ 10X_2$ Subject to $4x_1 + 6x_2 \leq 360$ $3x_1 + 0x_2 \leq 180$ $0x_1 + 5x_2 \leq 200$ and $x_1, x_2 \geq 0$	<b>(7)</b>
	<b>2</b>	Solve following LP Problem Using Graphical Method $\text{Max } Z=3X_1+ 4X_2$ Subject to $x_1 - x_2 = -1$ $-x_1 + x_2 \leq 0$ and $x_1, x_2 \geq 0$	<b>(7)</b>
<b>OR</b>			
<b>Q-2</b>		<b>Attempt all questions</b>	<b>(14)</b>
	<b>1</b>	<b>Solve following LP Problem Using Simplex Method</b> $\text{Max } Z=3X_1+ 2X_2$	<b>(7)</b>



		Subject to $x_1 + x_2 \leq 4$ $x_1 - x_2 \leq 2$ and $x_1, x_2 \geq 0$																															
	2	Write the Algorithm Steps for simplex Method																															
<b>Q-3</b>		<b>Attempt all questions</b>	<b>(14)</b>																														
	1	Apply MODI method and obtain basic feasible solution by VAM  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>I</td> <td>II</td> <td>III</td> <td>IV</td> <td>Supply</td> </tr> <tr> <td>A</td> <td>5</td> <td>2</td> <td>4</td> <td>3</td> <td>22</td> </tr> <tr> <td>B</td> <td>4</td> <td>8</td> <td>1</td> <td>6</td> <td>15</td> </tr> <tr> <td>C</td> <td>4</td> <td>6</td> <td>7</td> <td>5</td> <td>8</td> </tr> <tr> <td>Requirement</td> <td>7</td> <td>12</td> <td>17</td> <td>9</td> <td></td> </tr> </table>		I	II	III	IV	Supply	A	5	2	4	3	22	B	4	8	1	6	15	C	4	6	7	5	8	Requirement	7	12	17	9		<b>(7)</b>
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	2	Find Initial Solution Using NWCM, LCM, & VAM Method  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>D1</td> <td>D2</td> <td>D3</td> <td>D4</td> <td>Supply</td> </tr> <tr> <td>S1</td> <td>19</td> <td>30</td> <td>50</td> <td>10</td> <td>7</td> </tr> <tr> <td>S2</td> <td>70</td> <td>30</td> <td>40</td> <td>60</td> <td>9</td> </tr> <tr> <td>S3</td> <td>40</td> <td>8</td> <td>70</td> <td>20</td> <td>18</td> </tr> <tr> <td>Demand</td> <td>5</td> <td>8</td> <td>7</td> <td>14</td> <td>34</td> </tr> </table>		D1	D2	D3	D4	Supply	S1	19	30	50	10	7	S2	70	30	40	60	9	S3	40	8	70	20	18	Demand	5	8	7	14	34	<b>(7)</b>
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		<b>OR</b>																															
<b>Q-3</b>	1	Five Men are available to different five jobs find the minimize the total time  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>2</td> <td>9</td> <td>2</td> <td>7</td> <td>1</td> </tr> <tr> <td>6</td> <td>8</td> <td>7</td> <td>6</td> <td>1</td> </tr> <tr> <td>4</td> <td>6</td> <td>5</td> <td>3</td> <td>1</td> </tr> <tr> <td>4</td> <td>2</td> <td>7</td> <td>3</td> <td>1</td> </tr> <tr> <td>5</td> <td>3</td> <td>9</td> <td>5</td> <td>1</td> </tr> </table>	2	9	2	7	1	6	8	7	6	1	4	6	5	3	1	4	2	7	3	1	5	3	9	5	1	<b>(7)</b>					
2	9	2	7	1																													
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	2	Describe the transportation problem with its general mathematical formulation	<b>(7)</b>																														
<b>SECTION – II</b>																																	
<b>Q-4</b>		<b>Attempt the Following questions</b>	<b>(07)</b>																														
	a.	What is Feasible Solution?	<b>1</b>																														
	b.	Write the full form of PERT&CPM	<b>2</b>																														
	c.	Full Form of AOA & AON	<b>2</b>																														
	d.	What is Event?	<b>2</b>																														
<b>Q-5</b>		<b>Attempt all questions</b>	<b>(14)</b>																														



	<b>1</b>	<p>Given the following pay-off matrix of a two-person zero-sum game, determine the optimal strategies for the players and the value of the game. Is the game strictly determinable? Is it fair?</p> <table border="1" data-bbox="518 220 1149 443"> <thead> <tr> <th rowspan="2">Players A strategies</th> <th colspan="3">Players B strategies</th> </tr> <tr> <th>B1</th> <th>B2</th> <th>B3</th> </tr> </thead> <tbody> <tr> <td>A1</td> <td>-5</td> <td>10</td> <td>20</td> </tr> <tr> <td>A2</td> <td>5</td> <td>-10</td> <td>-10</td> </tr> <tr> <td>A3</td> <td>5</td> <td>-20</td> <td>-20</td> </tr> </tbody> </table>	Players A strategies	Players B strategies			B1	B2	B3	A1	-5	10	20	A2	5	-10	-10	A3	5	-20	-20	<b>(7)</b>
Players A strategies	Players B strategies																					
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	<b>2</b>	Discuss Types of Failure in Replacement Model																				
		<b>OR</b>																				
<b>Q-5</b>	<b>1</b>	<p>A dentist Schedule all his patients to 30minutes some patients takes more time and its probabilities given below</p> <table border="1" data-bbox="583 737 1084 1045"> <thead> <tr> <th>Category of services</th> <th>Times required (Minutes)</th> <th>Probability</th> </tr> </thead> <tbody> <tr> <td>Filing</td> <td>45</td> <td>0.40</td> </tr> <tr> <td>Crown</td> <td>60</td> <td>0.15</td> </tr> <tr> <td>Cleaning</td> <td>15</td> <td>0.15</td> </tr> <tr> <td>Extraction</td> <td>45</td> <td>0.10</td> </tr> <tr> <td>Checkup</td> <td>15</td> <td>0.20</td> </tr> </tbody> </table> <p>Random numbers 40 82 11 34 25 66 17 79 find the average waiting</p>	Category of services	Times required (Minutes)	Probability	Filing	45	0.40	Crown	60	0.15	Cleaning	15	0.15	Extraction	45	0.10	Checkup	15	0.20	<b>(7)</b>	
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	<b>2</b>	<p>five jobs each of which must be processed on the two machine A &amp; B Processing time in hours are given</p> <table border="1" data-bbox="423 1205 1245 1335"> <thead> <tr> <th>Job</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td>Machine A</td> <td>5</td> <td>1</td> <td>9</td> <td>3</td> <td>10</td> </tr> <tr> <td>Machine B</td> <td>2</td> <td>6</td> <td>7</td> <td>8</td> <td>4</td> </tr> </tbody> </table> <p>Determine the sequence of five jobs and total elapsed time.</p>	Job	1	2	3	4	5	Machine A	5	1	9	3	10	Machine B	2	6	7	8	4		
Job	1	2	3	4	5																	
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<b>Q-6</b>		<b>Attempt all questions</b>	<b>(14)</b>																			



1	<p>A Research and development department break up is as follows</p> <table border="1" data-bbox="375 178 1174 474"> <thead> <tr> <th>Job</th> <th>Immediate Predecessor</th> <th>Time (Days)</th> <th>Job</th> <th>Immediate Predecessor</th> <th>Time (Days)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>---</td> <td>5</td> <td>F</td> <td>D</td> <td>2</td> </tr> <tr> <td>B</td> <td>A</td> <td>7</td> <td>G</td> <td>C</td> <td>1</td> </tr> <tr> <td>C</td> <td>B</td> <td>2</td> <td>H</td> <td>E,F</td> <td>3</td> </tr> <tr> <td>D</td> <td>B</td> <td>3</td> <td>I</td> <td>G,H</td> <td>10</td> </tr> <tr> <td>E</td> <td>C</td> <td>1</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>(1) Draw the arrow diagram. (2) Identify the critical path and find the total project duration.</p>	Job	Immediate Predecessor	Time (Days)	Job	Immediate Predecessor	Time (Days)	A	---	5	F	D	2	B	A	7	G	C	1	C	B	2	H	E,F	3	D	B	3	I	G,H	10	E	C	1				(7)												
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2	<p>A firm considering replacement of machine whose cost price is Rs. 12,200 and its Scrap value is Rs.200 and data are as follows</p> <table border="1" data-bbox="363 665 1308 793"> <thead> <tr> <th>Year</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>Running cost</td> <td>200</td> <td>500</td> <td>800</td> <td>1200</td> <td>1800</td> <td>2500</td> <td>3200</td> <td>4000</td> </tr> </tbody> </table> <p>When should the machine be replaced ?</p>	Year	1	2	3	4	5	6	7	8	Running cost	200	500	800	1200	1800	2500	3200	4000	(7)																														
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1	<p>Following table is given calculate the total estimation time, critical path, total and free float For each non critical activity.</p> <table border="1" data-bbox="391 1056 1281 1367"> <thead> <tr> <th>Activity</th> <th>Duration</th> <th>Predecessor</th> <th>Activity</th> <th>Duration</th> <th>Predecessor</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>6</td> <td>--</td> <td>G</td> <td>2</td> <td>--</td> </tr> <tr> <td>B</td> <td>4</td> <td>A</td> <td>H</td> <td>10</td> <td>G</td> </tr> <tr> <td>C</td> <td>7</td> <td>B</td> <td>I</td> <td>6</td> <td>J,H</td> </tr> <tr> <td>D</td> <td>2</td> <td>A</td> <td>J</td> <td>13</td> <td>--</td> </tr> <tr> <td>E</td> <td>4</td> <td>D</td> <td>K</td> <td>9</td> <td>A</td> </tr> <tr> <td>F</td> <td>10</td> <td>E</td> <td>L</td> <td>3</td> <td>C,K</td> </tr> <tr> <td></td> <td></td> <td></td> <td>M</td> <td>5</td> <td>I,L</td> </tr> </tbody> </table>	Activity	Duration	Predecessor	Activity	Duration	Predecessor	A	6	--	G	2	--	B	4	A	H	10	G	C	7	B	I	6	J,H	D	2	A	J	13	--	E	4	D	K	9	A	F	10	E	L	3	C,K				M	5	I,L	(7)
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2	<p>A book binder has one printing and binding press for 7 manuscripts are as below</p> <table border="1" data-bbox="305 1530 1365 1661"> <thead> <tr> <th>Book</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> </tr> </thead> <tbody> <tr> <td>Printing (Time)</td> <td>20</td> <td>90</td> <td>80</td> <td>20</td> <td>120</td> <td>15</td> <td>65</td> </tr> <tr> <td>Binding (Time)</td> <td>25</td> <td>60</td> <td>75</td> <td>30</td> <td>90</td> <td>35</td> <td>50</td> </tr> </tbody> </table> <p>Determine optimal sequence and total time required for bring all books.</p>	Book	1	2	3	4	5	6	7	Printing (Time)	20	90	80	20	120	15	65	Binding (Time)	25	60	75	30	90	35	50	(7)																								
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