INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	**:**	**OPERATIONS RESEARCH**
Course Code	**:**	**A70352 - JNTUH - R15**
Class	**:**	**IV B. Tech I Semester**
Branch	**:**	**Mechanical Engineering**
Year	**:**	**2018 – 2019**
Course Faculty	**:**	**Mr. A. Somaiah, Assistant Professor, Dept of Mechanical Engineering.** **Mrs. T. Vanaja, Assistant Professor, Dept of Mechanical Engineering.**

OBJECTIVES:

Operation Research is also called OR for short and it is a scientific approach to decision making which seeks to determine how best to design and operate a system under conditions requiring allocation of scarce resources. Operations research as a field, primarily has a set or collection of algorithms which act as tools for problems solving in chosen application areas. OR has extensive applications in engineering, business and public systems and is also used by manufacturing and service industries to solve their day to day problems. This course is titled in Fundamentals of Operations Research. This course facilitates to learn various models to optimize a problem.

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<table>
<tr><th>S. No</th><th>Question</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td colspan="4">ASSIGNMENT-I</td></tr>
<tr><td>1</td><td>Use big –M method to solve the following
Maximize Z = 8x1 + 5x2 Subjected to
2x1+4 x2 ≤ 45 3x1+2x2 ≤ 40
x1 +x2 ≥ 30
x1, x2 ≥</td><td>Understand</td><td>1</td></tr>
<tr><td>2</td><td>Solve the following LP problem graphically.
Maximize $z = 2\,x_1 + x_2$
S.T $x_1 + 2\,x_2 \le 1\,0$, $x_1 + x_2 \le 6$, $x_1 - x_2 \le 2$, $x_1 - 2\,x_2 \le 1$
x_1 , $x_2 \ge 0$</td><td>Remember</td><td>1</td></tr>
<tr><td>3</td><td>The assignment cost of assigning any one operator to any one machine, Solve by using Hungarian’s Method.
<table>
<tr><td rowspan="2">Machine</td><td colspan="5">Operators</td></tr>
<tr><td></td><td>I</td><td>II</td><td>III</td><td>IV</td></tr>
<tr><td></td><td>A</td><td>10</td><td>5</td><td>13</td><td>15</td></tr>
<tr><td></td><td>B</td><td>3</td><td>9</td><td>18</td><td>3</td></tr>
<tr><td></td><td>C</td><td>10</td><td>7</td><td>3</td><td>2</td></tr>
<tr><td></td><td>D</td><td>5</td><td>11</td><td>9</td><td>7</td></tr>
</table></td><td>Understand</td><td>1</td></tr>
</table>

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<tr><th>S. No</th><th>Question</th><th>Blooms Taxonomy Level</th><th>Course Outcome</th></tr>
<tr><td>4</td><td>Solve the following transportation problem.
<table><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>Supply</td></tr><tr><td>I</td><td>9</td><td>16</td><td>15</td><td>6</td><td>15</td></tr><tr><td>II</td><td>2</td><td>1</td><td>3</td><td>5</td><td>25</td></tr><tr><td>III</td><td>6</td><td>4</td><td>7</td><td>3</td><td>20</td></tr><tr><td>Demand</td><td>10</td><td>15</td><td>25</td><td>10</td><td></td></tr></table></td><td>Understand</td><td>2</td></tr>
<tr><td>5</td><td>Calculate the following sequencing problem to minimize the time elapsed with sequence M1&M2, Also find the total elapsed time and idle times of each machine.
<table><tr><td>Job</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Machine M1</td><td>7</td><td>10</td><td>8</td><td>9</td><td>7</td></tr><tr><td>Machine M2</td><td>2</td><td>1</td><td>4</td><td>0</td><td>5</td></tr></table></td><td>Remember</td><td>2</td></tr>
<tr><td colspan="4">ASSIGNMENT – II</td></tr>
<tr><td>1</td><td>Machine A costs of Rs: 80,000. Annually operating cost are Rs:2,000 for the first years and they increase by Rs:15,000 every years (for example in the fourth year the operating cost are Rs:47,000).Determine the least age at which to replace the machine. If the optional replacement policy is followed.
(a) What will be the average yearly cost of operating and owing the machine (Assume that the reset value of the machine is zero when replaced, and that future costs are not discounted.
(b) Another machine B cost Rs: 1,00,000. Annual operating cost for the first year is Rs:4,000 and they increase by Rs:7,000 every year .The following firm has a machine of type A which is one year old. Should the firm replace it with B and if so when?
(c) Suppose the firm is just ready to replace the M/c A with another M/c of the same type, just the the firm gets an information that the M/c B will become available in a year .What should firm do?</td><td>Understand</td><td>3</td></tr>
<tr><td>2</td><td>Using the dominance property obtain the optimal strategy for both the players and determine the value of game. The payoff matrix for player A is
given
<table><tr><td rowspan="2">Player-A</td><td colspan="5">Player-B</td></tr><tr><td></td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td></tr><tr><td></td><td>I</td><td>2</td><td>4</td><td>3</td><td>8</td><td>4</td></tr><tr><td></td><td>II</td><td>5</td><td>6</td><td>8</td><td>7</td><td>8</td></tr><tr><td></td><td>III</td><td>6</td><td>7</td><td>9</td><td>8</td><td>7</td></tr><tr><td></td><td>IV</td><td>4</td><td>2</td><td>8</td><td>4</td><td>3</td></tr></table></td><td>Remember</td><td>3</td></tr>
<tr><td>3</td><td>A shopkeeper estimates the annual requirement of an item as 2000 units. He buys it from his supplier at a cost of Rs 10 per item and the cost of ordering is Rs 50 each time he order if the stock holding cost are 25% per year of stock value, how frequently should he replenish his stocks? Further suppose the supplies offers a 10% discount on orders b/w 400 and 699 stems and a 20% discount on
orders exceeding or equal to 700. Can the shop keeper reduce his costs by taking advantage of either of these discounts?</td><td>Understand</td><td>3</td></tr>
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S. No	QUESTION	Blooms Taxonomy Level	Course Outcome
4	At a railway station only one train is handled at a time. The railway track is sufficient only for two trains to wait while others are given signal to leave the station. Trains arrive at the station at an average rate of 6 per/hours and the railway station can handle them on an average of 12 per/hours. Assuming posission arrivals and exponential service distribution find the steady state probability of the various numbers of trains in the system. Also find the average number of trains in the system.	Understand	4
5	Use Bell man's principle of optimality to find the optimum solution to the following problem Minimize $z = y_1^2 + y_2^2 + y_3^2$, S.T $y_1 + y_2 + y_3 \leq 15$, $y_1, y_2, y_3 \geq 0$.	Remember	7

Prepared by: Mr. A. Somaiah, Assistant Professor
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